COAL

FEBRUARY, 1961

Yielding Jacks p 70
Mine-Site Coking . . p 106
Full Contents p 5

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PRICE \$1



New Shovel
Ups Stripping
Capacity

...р 76



Palletized
Supplies for
High Efficiency
...p 94

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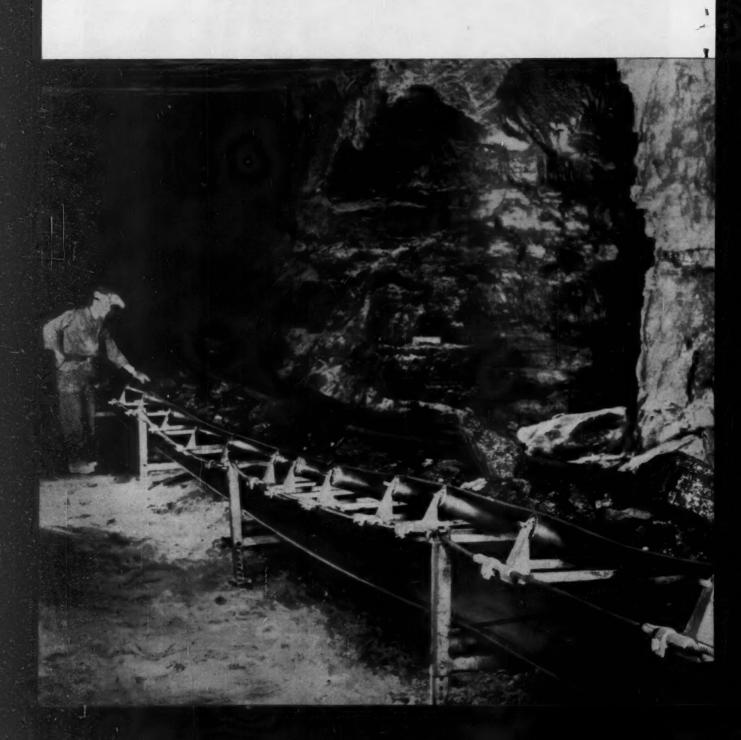
The B.F.Goodrich Flex-Rite Nylon cord construction resists heat blow-outs and flex breaks—often outwears the thick Rock Service tread. Many users find Rock Service tires can be retreaded again and again. Your B.F.Goodrich dealer has tires for all types of mine work. See him today

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Year	Units	Total Feet
'58	6	8,000
'59	4	9,500
'60	4	13,000
'61	Q	22 500

These belt conveyors are about equally divided between 36-inch and 48-inch widths.

purchased for their Moss #3 Mine.

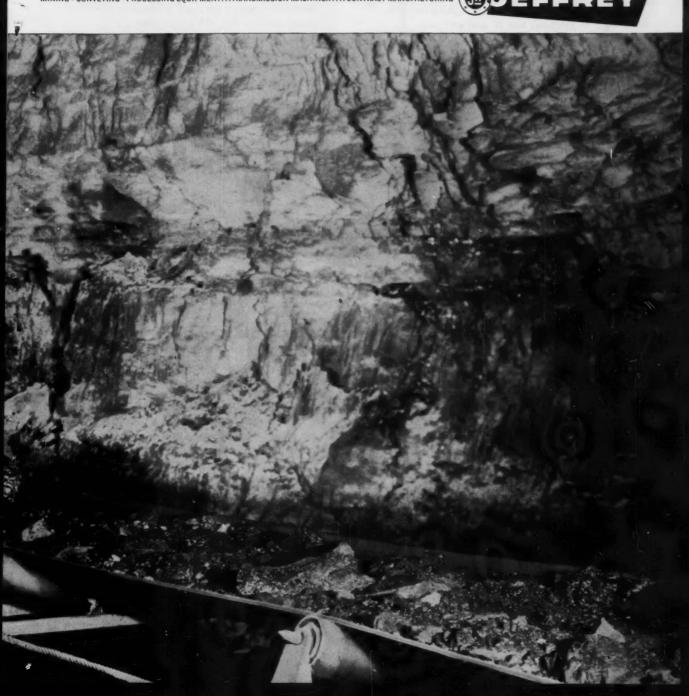
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This Month in COAL FEBRUARY, 1961 AGE

Features This Month:

Editorial: The Shape of the Futurep	69
Yielding Jacks Aid Pillar Pullingp	70
New Shovel Boosts Stripping Capacity at Green Coal p	76
1960 Sales of Coal-Mine Equipmentp	84
Preparation Contracts in 1960	90
Handling Packaged Mine Suppliesp	94
Maintenance Ideas:	
The Changing Nature of Maintenancep	98
Electrical Design and Layout Data p	98
The New Look in Cokingp	106
Mine Power Systems	110

Departments This Month:

Coal Commentor p 11	News Roundup p	26
Foremen's Forum p 116	Operating Ideasp1	20
New Equipment	t News p 124	

► Roof Support

Yielding	Jacks	Aid	Pillar	Pulling	1	P	70
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Wayne D. Snell, Chief Mine Inspector, Frick Dist., United States Steel Corp., Uniontown, Pa.

Yielding-type hydraulic jacks have been introduced into the Frick District mines to replace the cribs formerly used as supports in pillar-recovery work. Increased safety for the men at the face is the major advantage, inasmuch as the yielding jacks can be released and recovered from a safe distance. In addition, there is less exposure time involved in setting the jacks. Two types are used, one weighing 136 lb that will support 21 tons before yielding and the other weighing 50 lb and taking 8 tons of weight to yield.

Special—Complete diagrams of pillar-recovery sequence and roof-support patterns.

Using the pocket-and-wing method of pillar removal, the Frick District operations now achieve 85% recovery of the coal. Quality of the coal is maintained at a maximum through careful roof-control practices that keep the drawslate in place in mining the Pittsburgh seam.

► Stripping

New	She	vel	Boosts	4	St	ri	p	oi	ng	,	C	ap	a	ci	it	y	a	t	
Gr	een	Coa	l Co.															. p	76

A special long-range 270-B stripping shovel that incorporates many new design features has boosted stripping capacity and added to flexibility of operations at Green Coal Co., Panther, Ky. The shovel's new static control uses solid-state components in place of rotating units or electronic tubes. To get effective rock breaking at minimum cost, the company uses two-piece tamping plugs to save about one man-hour per hole in stemming time and primes AN-oil with three strands of 175-grain detonating fuse. Coal travels to the preparation plant in 50-ton trucks for processing in calcium chloride washers before being hauled to the company's barge-loading facility at Owensboro.

In the Spotlight-Facts about the new shovel; photos and description of the two-piece tamping plug.

► Equipment Sales

1960 Sales of Coal-Mining Equipment p 84
Preparation Contracts in 1960 p 90

Capacity of mechanical-loading and continuousmining equipment sold in 1960 dropped slightly (3%) from 1959. Loader sales were up, miner sales down, along with sales of shuttle cars and all types of conveyors except bridge.

Total capacity of all preparation projects contracted for in 1960, according to the annual Coal Age survey, was only slightly behind 1959. The capacity of mechanical-cleaning units, however, according to Bureau of Mines data, rose a whopping 35%. Southern West Virginia contracted for the big bulk of all the projects, with eastern Kentucky and Virginia quite active, plus northern West Virginia and Pennsylvania.

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HUMBLE OIL & REFINING COMPANY (355)





► Supply Handling

Handling Packaged Mine Supplies p 94

James L. Tenley, Chief Engineer, Delmont Fuel Co., Hunkers, Pa.

Flat cars on supply track, in a mine where coal is transported on belts, carry four rubber-tired trailers loaded with supplies for face area. Battery-powered tractor hauls the supply trailers to the face. Four trailer loads of supplies are sufficient for 40 cuts of coal. Roof bolts, rock dust and concrete blocks are received from suppliers in palletized form, thus facilitating handling on the surface by fork-lift truck.

Operating Ideas—Trailers make excellent service cars, carrying welder, tool box and explosives chest.

► Maintenance Ideas

The Changing Nature of Maintenance p 98

The proportion of our coal production that is mechanically loaded and mechanically cleaned continues to rise each year. Equipping mines with AC power systems is an established practice. New devices and techniques are coming into use for controlling mining and preparation processes. For these reasons maintenance is a vastly different function than it was 10 yr ago—and it will likely change as much again in the next 10 yr. The industry must plan now for the development of good maintenance personnel and organizations.

Added Attractions—Electrical design and layout data, and an illuminating entry on bases for greases used in mine equipment lubrication.

▶ Markets

The New Look in Coking p 106

John B. Shallenberger, President, Connellsville Corp., Connellsville, Pa.

The change in the economics of coking, marked by the rise of petroleum-based chemicals which have the markets for most of the by-products made in the operation of slot-type by-product plants, is resulting in a swing back to coking at the mine. With no or only partial recovery of by-products, the latter primarily to abate the smoke problem in urban areas, the new ovens, particularly the slot type as well as others, cut labor and other costs materially in producing for both chemical plants and blast furnaces. The growing practice of making long-term coke-supply contracts by coal companies operating new equipment is helping accelerate the trend back to the mines.

This Month

in COAL

MAYBE 420—The final spurt of 1960, plus an upward revision of the sum of weekly tonnage estimates by the Bureau of Mines, now leaves bituminous with an increase for 1960 rather than the deficit that earlier appeared in store. It could be that the final total could be substantially above the bureau's preliminary of 415 million, compared to 412 million in 1959. A compilation of state estimates by "Keystone Coal Buyers Manual," a "Coal Age" affiliate, indicates that final tonnage could reach 420 million. Keystone, incidentally, by the same process, hit the final 1959 total almost exactly on the head.

The cold snap of December, which extended into January in its market territory, also gave anthracite a lift, but not enough to cancel the heavy losses of the previous months. Consequently, hard coal wound up with an estimated total of 18.1 million tons, compared to 20.6 million in 1959.

'61 PACE—So far in 1961 the bituminous production rate has stayed pretty well in the groove in which it spent 1960. This reflects the continued lack of bounce in the economy as a whole. If the feelings of most forecasters prove to be correct, this even level of output is likely to persist all through the present quarter and possibly into the next as well. Any gains that may be racked up in 1961 will have to wait, it appears, until perhaps the last half shows a little more vitality to signal, it is hoped, the end of the recession in business and coal.

EXPORTS—The course of business abroad, and particularly in Europe, is now the subject of some question, in addition to any political explosions that may occur. So extra hedging is necessary in forecasting the export trend. But considering everything 1960 was a fairly good year and the 1961 start was auspicious. West Germany's increase of nearly 1,300,000 net tons in the duty-free quota of the U. S. is one welcome plus sign. On balance, exporters can reasonably expect a better 1961, barring, as noted depression or political explosions abroad, which are always a possibility these days.

CANAL COMEBACK?—The railroads will continue to grant reduced tariffs in 1961 to hold coal tonnage, with additional specific rates of as low as 6 or 7 mills per tonmile. At the same time the growing pressure for lower mine-to-market charges is, among other things, sparking interest in canals. Latest development is Army Engineer approval of a feasibility study for the Kaskaskia River, in southern Illinois, where the Big Muddy already is under study. Farther east, the Big Sandy has long been the object of attention. Maybe there will be no canal comeback, but some feel that their construction, where economically feasible, would be one answer, both short- and long-term, to at least part of the unemployment problem in certain coal areas.

KENNEDY AND OIL—The Eisenhower administration continued to the end to hold the line on oil imports by cutting the quota slightly for the first 6 mo of this year. One question is: Will the new administration go along? At the moment, there is no reason why it shouldn't especially if it means to maintain coal-mine jobs in line with the President's pre-election promise.

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How 33,000 psi cuts costs per ton

The heart of a dragline or excavator is its power source

Take the case of the Cat D397, used in the majority of large diesel powered machines. It has a horse-power rating of up to 730. Its 33,000 psi tensile strength block is precision built to provide a strong, rigid framework for all engine parts.

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If you could look inside the Cat D397 Engine you'd see additional evidence of quality in the high-strength crankshaft, in precision-ground camshaft, in the efficient cylinder heads and valve train.

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Engine Division, Caterpillar Tractor Co., Peoria, Ill., U.S.A.

This Month in Coal Age-Cont'd

► Power-System Grounding

Mine Power Systems p 110

D. E. Hamilton, Electrical Engineer, General Electric Co., Schenectady, N. Y.

Shortcomings in design of components for minepower distribution systems can create potentially hazardous conditions. The author reviews the fundamentals of grounding, with respect to surface substation grounding, maintenance of ground-wire continuity and minimum requirements for good grounding systems. Also included is a list of precautions to be observed—the don'ts that must be associated with ground-system installation.

Highlights—Diagrams and photos of rights and wrongs in grounding.

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This Month in Mining Practice

AHEAD IN '61—Even though the production rate may not pick up more than moderately for bituminous, 1961 is likely to see an increase in new-mine construction. Surprises in equipment probably will be few, though a number of new continuous miners will make their bows and R-C (remotely controlled) mining will move farther toward reality. There will be more work on hydraulic mining and longwall, and AC underground will be a bigger factor. Bigger equipment and more work especially on drilling, blasting and haulage will characterize stripping. By 1962, tons per man should be up to 13.75 to 14.00 in bituminous. Anthracite, too, should move up, possibly to 650

The tri-state area of Kentucky, West Virginia and Virginia got the lion's share of the new preparation facilities in 1960, with fine-coal and water-handling equipment more to the front in line with the trend of some years standing, which should continue.

AND ABROAD-Longwall-type continuous miners were the chief objects of attention abroad, with transport possibly second, the latter including conveyors of all types and pneumatic and hydraulic hoisting on an experimental basis. Russia, as might be expected, was particularly active in the development of new machines, the majority of the longwall type but some of the mobile type as well. Pitching coal engrossed much Russian attention, and some of the methods being evolved may be improvements over those used elsewhere. Hydraulic mining also was active if material in "Ugol," the Russian equivalent of "Coal Age," is any indication. Stripping also was a major recovery method in Russia, with much the same equipment as here. China, now ahead of Great Britain, in tonnage, is apparently working along much the same lines as the Russians, though pushing some ideas of its own in both deep and strip production.

BLUE YONDER BLASTING—One of the new proposals for overburden preparation at strip and opencut mines is blasting with nuclear agents. Chances of adoption? Not particularly good, at least in coal. But the idea, even though blue-yonder, focuses attention on the role of drilling and shooting in stripping. Coal in 1955, for example, consumed 124 million lb of high explosives other than permissibles, practically all in stripping. Strip output, anthracite and bituminous, was 123 million tons. Explosive consumption in 1959 was 280 million lb; strip tonnage was 128 million. A lot more rock is being moved in the strip mining of coal.

ROOF CONTROL—Pending the day when a large part of the underground production may come from remotely controlled mining units, roof falls will continue to be a major matter of concern. Even if injuries could be eliminated, roof control would still be a matter of major concern if the cost remained as high as it is now—or went higher. Bolts have, as intimated, helped. Now work on other forms of permanent and temporary support, especially the face shield and hydraulic supports, is being accelerated, with the expectation that progress will be made both in cutting fatalities and in the cost of support in the years immediately ahead.



Trackwork designed for big payloads

There's nothing jerry-built about this haulage system; it didn't "just grow." It was carefully planned by Bethlehem engineers and custom-built to meet the owners' needs. It's a big, heavy system, using big, heavy Bethlehem rail to haul big payloads today and for many years to come.

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The Coal Commentator

Real and Permanent

How many men will be working in the coal industry in 1965? This is a question with more than ordinary implications in view of the added unemployment in coal areas growing out of business slackness, plus the fact that overall industry requirements for manpower will continue to decline as productive efficiency increases.

It has been said that if bituminous was running at 500 million tons a year there would be no problem. Certainly, without the depression bulge in unemployment, the effects of increased productivity would have been offset to a considerable degree by normal departures from the industry. And it also is being contended, with equal justification, that if special government help is to be vouchsafed, the quick way to get a miner back to work is to give the mine business so that it can reopen.

Doing just that could be cheaper in the short run, as well as the long, though other measures are of course necessary for a permanent overall solution. But it is to be hoped that the final program worked out by the new administration will be quickly effective and economically sound. If it should boost the demand for coal—on an economic basis—the benefits would be real and permanent.

200 Tonners Ahead?

The 1960 annual report of TVA points up once again its growing dependence on coal (18,710,000 tons in the fiscal year ended June 30), but also includes a few other interesting tidbits. One concerns future coal sources. The report notes that TVA has optioned 71,000 acres of coal in eastern Kentucky and is now engaged in test exploration.

Another note, anent the new Paradise plant, seems to forecast trucks with a new high in capacity, as follows: "A pair of 2,000-ton hoppers to accomodate 100- and 200-ton trucks will be provided." If and when built—and it seems a certainty—these units will again nail down stripping's position as king of the hill in size of equipment. Such equipment is a big reason why a price of \$2.95 a ton becomes both possible and profitable.

Or Did It?

Some of the oldtimers, including your commentator, can remember the days when mine after mine was supplemented by row upon row of beehive ovens, with the plume of smoke by day and the skyglow at night visible for miles. Then the slot-type byproduct oven pretty well settled the hash of the beehive type—or did it? It now appears that the modern beehive oven may soon reoccupy an important niche in the coke-production picture. It will supply blast furnaces as of old, but it also will supply coke for a wide range of chemical processes, including smelting and refining of non-ferrous metals.

One of the reasons for the new popularity of the beehive oven is that by-products are not the prizes they once were. There is a substantial body of opinion that the beehive oven and coking at the mine will become a significant activity in the relatively near future, paralleled by increased charring.

Demountable Reels?

Trailing cables probably always will be a problem in coal mining, particularly underground. And foremost among the headache-causers is the shuttle-car cable. This is understandable because it would be hard to find a tougher cable service.

Because it is the toughest of all services the delays tend to increase, and delays to shuttle cars can hurt the most. One answer is super maintenance, but even the best still involves man-hours and delays beyond that experienced with practically any other machine. This has led to at least one thought that detachable reels be designed for shuttle cars. Such reels would not necessarily eliminate breaks or other damage, but they would induce changing of cables when they really needed attention, and thus would prevent the compounding of difficulties which is the result of the usual tendency to try to operate with cables that should be taken out of service for rebuilding or, if necessary, scrapping.

AN Progress

Though they were optimistic it is perhaps fair to assume that Robert L. Akre and Hugh B. Lee Jr. could not have foreseen the revolution that would follow their development of a method of using fertilizer-grade ammonium nitrate for overburden blasting in stripping.

The extent of the revolution in coal can be gaged from recent Bureau of Mines figures on consumption of explosives. Total use of ammonium nitrate by coal in 1959 was 236,500,000 lb. Other high explosive use was only 43,100,000 lb, meaning that ammonium nitrate in 5 yr has gone from zero to 84.6% of the explosive use for stripping—an advance that quite truly could be described as phenomenal.

Low cost, ease of use and safety are among the reasons for this progress, this in spite of the fact that the potentialities of the product have not yet been fully explored. Research, experimentation and field testing should expand still further the versatility and applicability of ammonium nitrate.

NEW LIGHTWEIGHT CONVEYOR BELT AFFORDS SUBSTANTIAL OPERATING ECONOMIES

RECENTLY INTRODUCED WOVEN CARCASS NEOPRENE BELT HAS ALREADY PROVEN ITS SUPERIORITY IN RUGGED UNDERGROUND MINING SERVICE

A new kind of conveyor belt, designed around a revolutionary lightweight woven fabric carcass, is proving itself in severe mining service.

Because of the strength and toughness of its interwoven carcass, the new belt has a long life expectancy. It's flexible . . . troughs and trains well . . . and does an excellent job of coal handling.

Top and bottom covers of Du Pont neoprene contribute to the belt's superiority. Neoprene provides needed safety because it is fire-resistant; will not support combustion. It gives improved performance because its high coefficient of friction eliminates power loss caused by slippage . . . reduces belt "run out" at loading points. Neoprene provides greater economy because its balanced com-

bination of properties affords resistance to abrasion and impact; protects belt carcass from damage by acid mine water, mildew, and oil or grease sometimes present in mining operations.

Other advantages are cited for the new belt. For example, it's easier to handle and install, has longer wearing edges, holds splices and trains better. In addition, better flexibility and handling ease result in increased operating efficiency.

We'd be happy to tell you more about the dependability and long life of a neoprene belt. For more information on this radical improvement in belt construction—and sources of supply—write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. CA-2, Wilmington 98, Del.



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"JFI Positive Performance Feeder cuts costs six ways at Wyatt-Seanor Mine."



Says John Harvey, Superintendent, Wyatt-Seanor Mine, Simpson Coal and Chemical Corporation.

Simpson Coal and Chemical increased production and cut costs when they installed a JFI positive performance Feeder in their Wyatt-Seanor Mine in Western Pennsylvania. John Harvey, Wyatt-Seanor Superintendent, reports: "The JFI

Feeder allowed us to more fully utilize belt capacity by conveying more coal at slower belt speeds-100 f/p/m less than before. Belt wear was

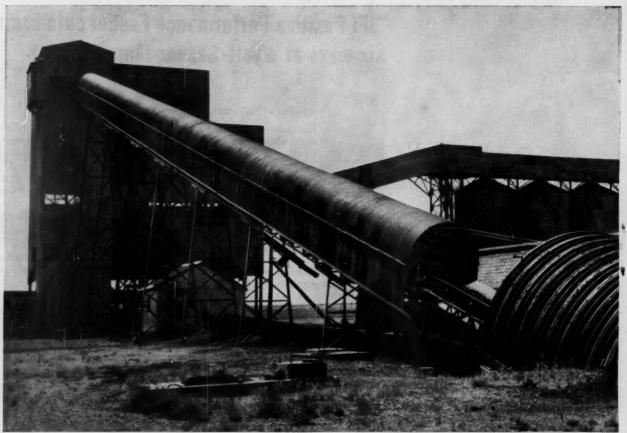
noticeably reduced.

"We were also able to eliminate mainline belt spillage from the feeder point to the outside of our mine, and now there is no need to attend belt transfer points. Many man hours are being put to use at more productive jobs. Elimination of surges and overload conditions has reduced mechanical maintenance on belt drives and cut horsepower requirements on those drives."

JFI Positive Performance allows high shuttle car discharge rate, complete flexibility of reduction ratio, and profitable multiple belt operation. Feeders are available for both coal and ore mining operations.

If you're after increased production at lower cost, check JFI's com-





Second of two main entry belts, this one 36" x 964', is shown emerging from company's Lincoln slope mine and transporting coal to the tipple. Barber-Greene conveyor system presently totals

7,205' in length above and below ground level. Mine production since operations started in 1949 has totalled more than 1,500,000 toos.

12-year report on Clayton Coal Co. conveyors:

SAVES \$40,000 ON DESIGN, 1/15 of a cent PER TON

"Barber-Greene engineering assistance plus Barber-Greene conveyor performance helped us handle 1,500,000 tons of coal at lowest cost," says President H. B. Crandell

The Clayton Coal Co., St. Vrains, Colo., saved \$40,000 on a Barber-Greene belt conveyor system before it moved an ounce of coal . . . and has been saving money with the same conveyors each year since 1949.

But President Howard B. Crandell has all the facts and this is his report:

"Barber-Greene conveyor engineers got our business by showing us how to save \$40,000 in the design stage. They suggested using two main entry

conveyors while all other firms made layouts utilizing a single main entry belt. This Barber-Greene design permitted use of lower-cost belt because of reduced tensions.

"Twelve years of conveyor system operation has provided further proof of how well our conveyors were designed and aligned because we haven't replaced a single belt in that time. Furthermore, after moving 1,500,000 tons of coal to the tipple, we figure our idler maintenance at only 1/15¢ per ton.





By splitting the main entry conveyors at this point and using a 1,023' and a 964' conveyor to lift coal from the 460' level to the tipple, Barber-Greene conveyor engineers saved the mine owners \$40,000 in initial investment.



All six belts in the present conveyor system are 12 years old, none having been replaced. Conveyor performance has been equally outstanding, only 20 carriers and return rolls requiring replacement since 1949.

NO BELT REPLACEMENTS, IDLER MAINTENANCE

Only 20 carriers and return rolls out of more than 2,500 on the job have needed to be replaced."

You can quickly discover how this same imaginative Barber-Greene approach to belt conveyor system design can work to your benefit. Simply call in your Barber-Greene conveyor specialist for a quote on the system you are planning. Chances are you can duplicate the experience of the Clayton Coal Co. and save money two ways—on system design and on performance over the years. Whether your job calls for standard equipment, specially engineered equipment, or a combination of both, your quote will reflect more than 40 years of belt conveyor experience.

Your belt conveyor equipment headquarters

Barber-Greene

Main Office and Plant A U R O R A, I L L I N O I S, U. S. A.
Other Plants DeKalb, Milwaukee, Detroit, Canada, England, Brazil, Australia

CONVEYORS . LOADERS . DITCHERS
ASPHALT PAVING EQUIPMENT

GREENVILLE RIPPER FOR IH TD-15, 20, 25 TURN TRACTOR INTO 4-WAY MACHINE

... rip ... bulldoze ... tow ... pushload without changing tools

RIP AT ANY DEPTH . . . Pitch and depth control adjustments permit ripping at any depth. From basic settings, operator can adjust hydraulically as required. Settings can be made in seconds. Hydraulic system holds points at desired depth. Shank design and pitch control keep points at best ripping angle.

LIVE SWIVEL ACTION . . . Shanks smoothly swivel 15° in either direction on heavy pins — seek out weak spots in rock. It gives points a live action that shatters rock with a jackhammer action. Shanks follow tractor like a trailer.

FINGER-TIP HYDRAULIC CONTROL

... Finger-tip control of the "powermatched" hydraulic system exerts Goliath-like power which distributes the weight of the tractor on ripping points for fast, complete penetration.

GREENVILLE



BOOSTER RIPPING . . . A push block, straddling the center shank and swing beam can be attached very quickly by pinned connections. This permits use of the combined efforts of two tractors for added ripping power.



CURVED SHANKS are available in 24" maximum digging depth for TD-20 and 25. These shanks give their best performance in materials that are not blocky or slabby in formation.



STRAIGHT SHANKS are available in 24", 42" and 48" maximum digging lengths for TD-25 and all will adapt to the standard ripper without special attachments. Greenville's straight shanks give top performance in a wide range of materials. 18" penetration shanks are available for TD-15.



REPLACEABLE POINTS For use with curved and straight shanks.

一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个
THE GREENVILLE TRAILING SWING BRACKETS work separately, each pivoting about a heavy pin to seek out weak
spots in rock. The ripper weight balances dozer, resulting in greater traction and more usable horsepower.

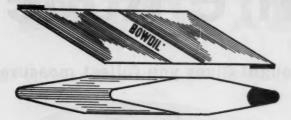
	Max. Ripping Depth	Ground Clearance					Cyl. Die	Pist.	
Tractor	W/Std. Overall	4" Shank 18" Shank Tool Beam	Overall Width Tool Beam	Tool Beam Cross Sect.	(Rear PTO)	Bore	Stroke	Red Diam.	
TD-25	24"	31"	-	108"	11" x 12%"	60 gpm @ 1000 psi	8"	151/2"	3"
TD-20	24"	24"	Ŧ 11	102"	10" x 12"	44 gpm @ 1000 psi	6"	15"	214"
TD-15	18"	141-11	12"	90"	8" x 8"	37 gpm @ 1000 psi	5"	15"	2"



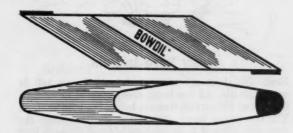
GREENVILLE STEEL GAR COMPANY

Greenville, Pennsylvania

Dollar for dollar in cost of cutting, they OUTPERFORM all others



Regular Diamond Bit BOROD TIPPED. Designed for medium cutting conditions, they save power, produce coarse cuttings.



No. 1-20

Heavy Diamond Bit BOROD TIPPED. Designed for severe cutting conditions, such as iron pyrites and rock.

Newest

BOROD TIPPED

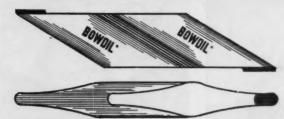
BOWDIL BITS

4 MOST POPULAR STYLES

These various types are designed for specific requirements. After the BOROD is placed on the Special Alloy Steel body it is heat-treated to the most serviceable

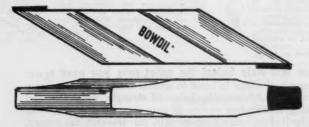
We are happy to offer these quality bits for your individual needs and cutting conditions.

TO HELP YOU RE ORDER, PLACE YOUR TYPE BIT ON THESE ACTUAL SIZE DRAWINGS



No. 1-28

Regular Concave Bit BOROD TIPPED. Designed for maximum power savings. Concave shape automatically maintains side clearance. (Patented feature.)



No. 1-29N4

Heavy Duty Concave Bit BOROD TIPPED. Designed for very severest service.

ORDER BY



THE BOWDIL COMPANY . CANTON 7, OHIO

Gentlemen: Rush us

(Quantity)

(PLEASE PRINT)

Address

WDIL COMPANY

Union Wire Rope

Super strong! Super tough! Gives you fullest measure



Here's a result of improper socketing. It was caused by using a poorly designed or worn-out wedge socket. Failure at the dead end can damage other sections of the rope, too.



Rusty Road to Ruin

Rust—No. 1 enemy of steel—takes a heavy toll in wire rope life. An insidious, silent type of killer, rust often does irreparable damage before it's even noticed. The one-strand break shown here resulted when the rope was allowed to become rust-bound through lack of lubrication. Tests show that, with other conditions ideal, properly lubricated rope has up to 10 times the life expectancy of dry rope.

Union Tuffy's on the job . Some of the popular types and uses



Tuffy Scraper Rope
Flexible enough to take sharp
bends; stiff enough to resist
looping and kinking when slack;
highly resistant to the shock of
load impact—that's Tuffy balanced construction. Mount a reel
on your scraper—save wasting
sound rope.



Tuffy Slings and Hoist Lines

Slings are a patented, 9-part machine-braided wire fabric that is next to impossible to knot or kink. Hoist lines have built-in strength, toughness, flexibility. Balanced—a top-performing team for handling every type of material. In addition to Tuffy, Union Wire Rope furnishes a complete line of slings.



Tuffy Dozer Rope

Mounts right on your dozer in a 150' reel. When rope shows wear, just feed through enough to replace the damaged part. Saves rope, gives you a bonus of extra service. Also available in 300' and 500' reels.

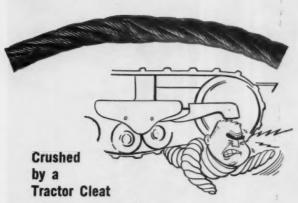


Union's Field Organization Will Help Select the exact rope you need from the Tuffy family of wire rope and slings tailored to special needs and from more than 1600 standard constructions. All have the balanced strength, toughness and flexibility that add up to long, trouble-free service. If your rope need is new, even more specialized, you are invited to bring your case to our research laboratory. That's the way many of today's special purpose constructions were developed. No obligation. Call your Union Distributor—listed in phone book Yellow Pages.

Tuffy Tips



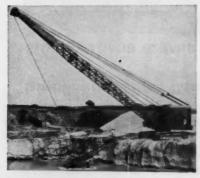
of service life when properly used ... not abused ...



The Sunday punch for this piece of wire rope was delivered by a tractor cleat-just one of many crushing injuries caused by rope being run over or banged into by hard, sharp objects. Even the toughest wire rope is no match for this kind of mistreatment.



This rope jumped out of sheave and was soon destroyed by pulling around the shaft. Actually, it was a case of sudden slack which threw the rope out of the sheave.



Tuffy Dragline Rope

High abrasive resistance and super flexibility. Gives long service, dependable action in handling any material—wet or dry dirt, sand, gravel, rock, minerals. Rides smoothly on grooves—hugs the drum when casting for full load.

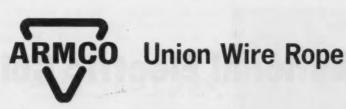


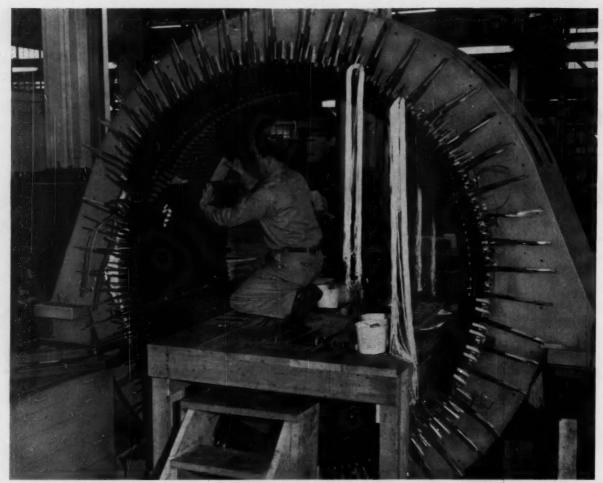
Union Wire Rope Handbook of TUFFY TIPS...Free!

The "Tuffy Tips" shown here are quoted right out of Union's handbook. In it there are dozens of other priceless hints on the correct use of wire rope. The common abuses and how to avoid them. How to save costly injuries. Maintenance tips. The proper fittings and how to apply them. Recommended sizes. Many other facts and suggestions that will cut down your rope costs and help you get out of wire rope the full service we build into it. No charge. Write Union Wire Rope, Armco Steel Corporation, 2130 Manchester Ave., Kansas City 26, Missouri.



1-61





Installing NECCOBOND coils in 4000 HP, 400 rpm, 6600-volt stator of mill drive motor.

NECCOBOND insulation system protects motors in severe environments



Completed winding passes 23,000-volt test.

Provides optimum resistance to moisture, heat, corrosive atmospheres NECCOBOND is specified for rewinding many big rotating machines, like this 6600-volt steel mill motor, that have to perform in rugged environmental conditions.

NECCOBOND is based on time-proven insulating materials—mica and glass. These are welded by a special impregnant into a tenaciously bonded, resilient, voidless insulation wall. A unique method of fabrication assures homogeneous insulation.

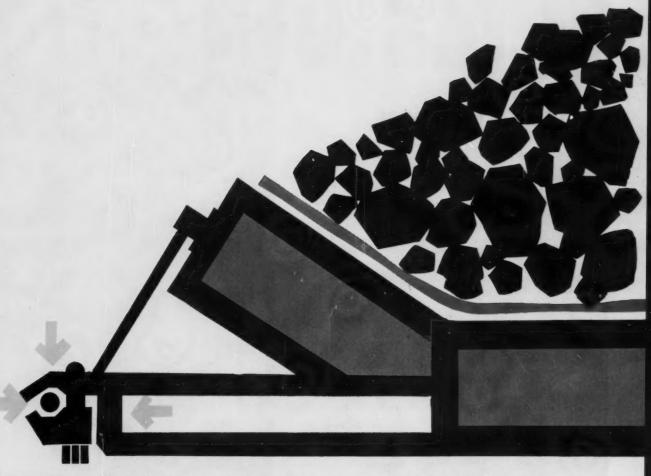
When you require rewinding or rebuilding of your heavy duty motors, particularly where moisture, heat, or corrosive atmospheres are encountered, specify NECCOBOND. For information call National's Columbus plant... HUdson 8-1151...or check the nearest National field engineer.



National Electric Coil

COLUMBUS 16, OHIO . IN CANADA: ST. JOHNS, QUEBEC





WHO ORIGINATED THIS BETTER BELT CONVEYOR?

LONG-AIRDOX did—just as they have pioneered so many other major advancements in coal mining equipment and methods.

This LONG-AIRDOX development, the "Lo-Rope" belt conveyor,* differs from old fashioned designs in that the idlers mount on top of the rope side frames and are self-aligning. Some of the proved advantages of this construction are: belts stay centered as belt motion tips the idlers in direction of travel; conveyor stays aligned—rocker support stands can't walk out of position: fixed deep troughing angle centers load better and increases belt capacity; ropes are completely out of the way, making it safer to handle men and supplies; and belts last longer because they can't be cut by hanger stands.

For more information detailing how you can move more coal more profitably with "Lo-Rope" belt conveyors, write the Long-Airdox Company, Division of Marmon-Herrington Company, Inc., Oak Hill, W.Va.

*U.S. Pat. No. 2,896,774

LONG-AIRDOX





17,122.0

in Hazard #7 Seam



"We auger mined 17,122.05 tons of coal in October, 1959, with our McCarthy Coal Recovery Drill," says Stamper Collins. "We averaged 95 tons per man per shift as opposed to 13 tons in deep mining. We've had less than four days downtime due to mechanical troubles in more than two years."

Stamper Collins is an old, long-established user of Salem Tool equipment. He has produced as much as 64,967.90 tons of coal in five months. Like most Salem customers, Collins works his drill 'round the clock in all kinds of weather. He stops only for once-a-week servicing and maintenance.

These heavy, rugged, powerful units move from hole to hole under their own power on hydraulic skids. No extra 'dozer required. And they work close to the face—even on an inside curve of the highwall. Salem-built McCarthy recovery drills load from either side. You need only a two-man drill crew.

If BIG TONNAGE at low cost is important to you, get the facts on Salem's McCarthys today. Initial investment is less; pit-to-pit moves faster; set-up quick. Add it up... augered coal costs less with a McCarthy!

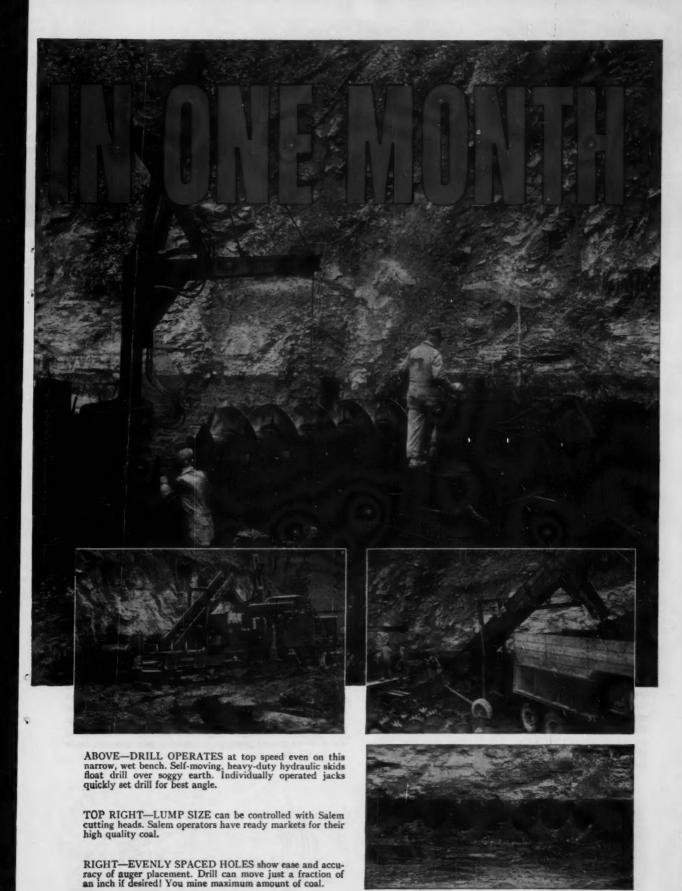
TWO-MAN OPERATING CREW adds new auger quickly. This Model 1500-30-36-42 has faster carriage travel and greatly increased horsepower. Built-in conveyor speeds loading.





SALE SON TO

763 SOUTH ELLSWORTH AVE. . SALEM, OHIO





NEW 630 WITH ATHEY COAL HAULER

420 HP (335 HP flywheel) ... 41.5 MPH ... 60 ton PH630 Coal Hauler (built by Athey Products Corporation). Also available: 630A Tractor-Scraper ... 28 cu. yd. (21 cu. yd. struck) and 630-482C Tractor-Scraper . . . 35 cu. yd. (27 cu. yd. struck).



NEW 631

420 HP (335 HP flywheel) ... 31.2 MPH ... 28 cu. yd. (21 cu. yd. struck).

BIG! POWERFUL! NEW CAT 630 AND 631

MATCH POWER TO JOB CONDITIONS-AUTOMATICALLY!

A new concept in power shift transmission coupled with a new 420 HP engine . . . plus other proven new developments . . . provides the last word in operating, service, maintenance ease and economy. The four-wheel 630 and two-wheel 631 join the widely accepted DW20, DW21 and 619 to give you an even broader choice of hauling units from Caterpillar.

The new transmission and new engine on the 630 and 631 are designed and teamed to fit power to working conditions. This tailored power train, together with unit construction, greater scraper and wagon capacity, air-actuated cable control and new

tires, makes the 630 and 631 the ultimate in hauling equipment design! Some of the features are described here. For complete proof of performance, ask your Caterpillar Dealer!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

RPILLA



NEW 29.5 x 35 TIRES

This all-new tire size was originally developed for the 630 and 631, to provide the best combination of size, capacity and rideability at lowest cost per yard. These tires were proven by exhaustive laboratory and field tests.

NEW SCRAPERS

Matching 28 cu. yd. heaped (21 cu. yd. struck) scrapers feature increased capacity, better loading. Sheave bearings now have 125-hour lubrication period. Other matching trailed units are also available.

NEW CABLE CONTROL

Live power provides control whenever the engine is running. Air-actuated controls cut operator effort in half, yet retain "feel" of the control. New cable savers prevent breakage due to double-blocking.

IMPROVED STEERING

New two-jack steering makes the 631 easy to maneuver, yet retains "feel" of the road. Improved steering for the 630 absorbs shocks outside of the steering gear, provides easier handling in tight quarters.







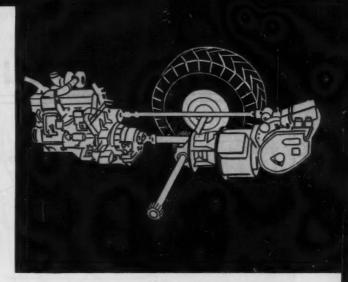




3 SHIFTS-9 SPEEDS

POWER SHIFT TRANSMISSION. This new concept in power shift transmission automatically adjusts the 630 and 631 to job conditions. Key to this system is the torque divider transmission mounted directly behind the engine, which combines planetary gears with a torque converter so as to provide power to the three-speed-range transmission in one of three ways: (a) torque divider drive (a combination of 75% direct, 25% torque converter); (b) direct drive; (c) overdrive. Result: nine different speed variations—but the operator need only concern himself with the three speed ranges and load range controlled by one lever. (A safety latch prevents accidental engagement.) The rest is completely automatic, governed by a mechanical-hydraulic system. Here's how it works:

Operator moves lever into 1, first range, to start machine down haul road. The machine is now in torque divider drive for easy start and greatest rimpull. As speed increases, converter is no longer required, so the transmission shifts automatically to direct drive. When conditions permit, it automatically shifts to overdrive. As speed increases, the shift indicator dial shows operator when to shift to second speed range, 2. Again the transmission automatically goes into torque divider drive. As before, when conditions permit, it automatically shifts to direct drive and then to overdrive. This same cycle can be repeated in third range.



NEW 420 HP ENGINE AND MATCHED POWER TRAIN

Downshifting is automatic, too. As transmission senses increasing power needs, it shifts down from overdrive to direct drive to torque divider drive. When conditions require it, the indicator tells the operator when to select the next lower speed range. Once back in the cut, operator shifts to load position, L. This locks the transmission in torque divider drive of the first speed range.

ALL-NEW CAT ENGINE. Designed specifically for the 630 and 631, this six-cylinder, 5.4" bore x 6.5" stroke D343 engine is turbocharged and aftercooled. It develops 420 HP maximum (335 HP at the flywheel).

Typical of the newness is head design. The engine is parallel ported with dual intake and exhaust valves for most efficient air system. Overhead camshafts eliminate rocker arms and push rods. New shelf head design results in fast coolant circulation for outstanding heat dissipation.

In addition to these and other new features, the engine offers...the economies of the proven Cat fuel system with precombustion chamber (burns No. 2 fuel oil—premium diesel fuel not required)...pressure ratio controlled turbocharger for optimum air flow throughout the engine operating range...aftercooler for greater air density for more complete combustion.

FULL UNIT CONSTRUCTION—EASIER SERVICING

TRANSMISSION UNITS

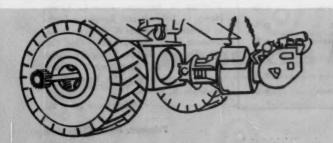
Range transmission is case mounted for accessibility, can be removed as a unit with cable control and differential carrier. Another timesaver: torque divider transmission is removable as a unit without disturbing the engine. Transmission control units are accessible without disturbing the transmission.

NEW RADIATOR-FAN UNIT

Fan is mounted on the radiator for more efficient cooling. Now radiator, side plates and fan can be removed as a unit for servicing—or to provide easy access to the front of the engine.

SERVICING TIMESAVERS

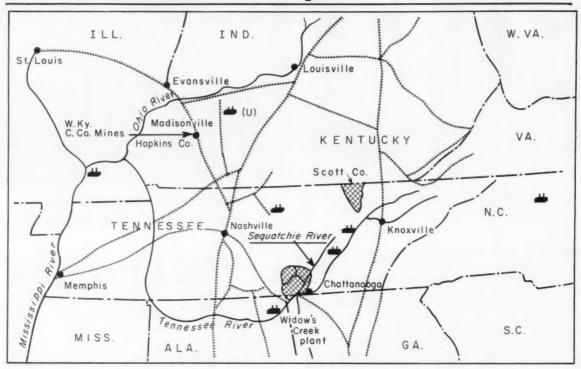
Dash swings away to expose entire left side of 631's engine. Crankcase guard pivots down for easy access to the bottom of the engine. For easy tire removal, rear fenders tip forward on the 630, and are easily removable on the 631.







News Roundup



Tennessee Operators File Antitrust Suit

Charge conspiracy . . . Ask \$30 million damages . . .

Antitrust suits have become the latest weapons in the long-standing economic struggle in the coal fields of eastern Kentucky and Tennessee, involving competition between union and nonunion operators in the area, competition between the area generally and other areas, particularly western Kentucky, and also attempts by many previously union operators to escape the extra costs flowing out of the last wage agreement.

Among those filing antitrust actions were the owners of 16 small coal mines in the Sequatchie Valley in southern Tennessee who charged in a suit filed Jan. 6 in U. S. District Court for the Eastern Dist. of Tennessee, Southern Div., Chattanooga, that they are victims of "a wrongful and unlawful conspiracy in restraint of trade." They ask \$30 million in damages.

Plaintiffs

The plaintiffs in the Jan. 6 suit divided themselves into three groups according to type of mining operation:

1. "Strip miners" – George Ramsey, Elmer D. Studer, Walter H. Studer and Dale F. Studer, dba Walden Ridge Coal Co., Pikeville Coal Co., Inc. 2. "Hand-loading"—W. J. Travis and J. H. Graham, dba Ninth West Coal Co., Stephenson Brothers Coal Co., W. T. Morrison and J. H. Graham, dba M&G Coal Co., M. T. Dixon, dba Dixon Coal Co., H. E. Kilgore, Gilbert Taylor, W. E. Huskey, J. L. Savage, Carl Deakins, dba Deakins Coal Co., Edward Nunley, dba Edward Nunley Coal Co., Leon Nunley, dba Leon Nunley Coal Co., Paul

In This Section

Production Figures p	28
Preparation Facilities p	37
People in Coal p	38
Coal Abroad p	42
Current Coal Patents p	46
Coming Meetings p	46
Mines and Companies p	58
Utilization p	58
New Books p	62
Equipment Approvals p	67

Gibbs, dba Paul Gibbs Coal Co., Hershel Meyers, dba Meyers Coal Co., and J. H. Goforth, dba J. H. Goforth Coal Co.

3. "Mechanized operators"—Ellis Ward, Lon Varnell, dba Tracy City Coal Co., Mutual Coal Co., Inc., Marshal Meeks and Bill Meyers, dba Meeks & Meyers Coal Co., and F. W. Pryor, dba Pryor Coal Co.

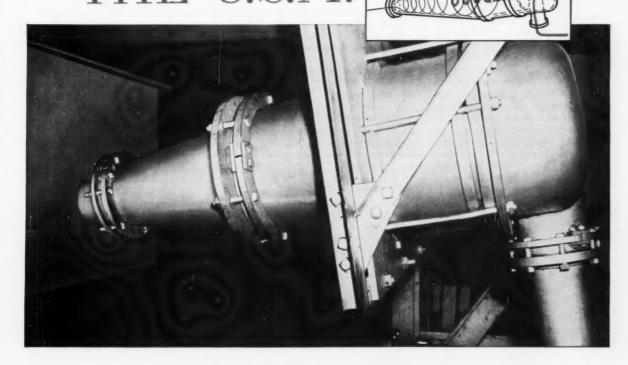
All three groups brought the action "on behalf of themselves and all other individuals, partnerships and corporations similarly situated, mining and marketing coal in the Southern Appalachian coal fields."

Defendants

Named as defendants in the action, brought under terms of the Sherman Antitrust Act, were the United Mine Workers of America; John L. Lewis, Henry G. Schmidt and Josephine Roche as trustees of the UMW Welfare & Retirement Fund; West Kentucky Coal Co., Inc.; Cyrus W. Eaton; Tennessee Valley Authority; G. O. Wessenauer, TVA manager of power; and the Louisville & Nashville R. R. Co., Inc.

(Continued on p 28)

NOW IN OPERATION IN THE USA



The Dutch State Mines

HEAVY MEDIUM CYCLONE WASHER

A new era in fine coal cleaning in the United States has been inaugurated with installations by Roberts & Schaefer of the Dutch State Mines Heavy Medium Cyclone Washing System.

The successful performance of the Heavy Medium Cyclone Washing System during the first few months of operation in this country confirms previous experience of 40 plants in 15 countries.

It cleans fine coal cleaner than any other cleaning system. It substantially increases recovery of fine coal. It enables coal operators to upgrade coal quality to meet premium market requirements. If you are considering a new fine coal cleaning plant, or rehabilitation of your present facilities, get full information about the Dutch State Mines Heavy Medium Cyclone Washing System. It is available in this country exclusively from Roberts & Schaefer.

In the engineering and construction of Heavy Medium Cyclone Washing Plants in the United States, Roberts & Schaefer has the unique advantage of the collaboration of the Dutch State Mines engineering organization with its technical knowledge and experience with many successfully operating installations around the world.



ENGINEERS & CONTRACTORS

ROBERTS & SCHAEFER

DIVISION OF THOMPSON-STARRETT COMPANY, INC.

201 NORTH WELLS STREET, CHICAGO 6, ILLINOIS

NEW YORK 19, N.Y. . PITTSBURGH 22, PA. . HUNTINGTON 10, W. VA. . ST. PAUL 1, MINN.

Conspiracy Charged

The conspiracy, the operators charged, is being operated "to fix and control prices, eliminate and suppress competition and otherwise control the marketing of coal in the Southern Appalachian coal region." The complaint puts it this way:

"That the defendants, have knowingly and continuously engaged, and are now engaged, on the date of the filing of this complaint, in a wrongful and unlawful conspiracy.

"That the defendants, the UMW and the UMW Welfare & Retirement Fund have knowingly and continuously engaged, and are now engaged, in a wrongful and unlawful conspiracy to gain control of the coal industry, among other means, illegally and forcibly 'organizing' many of the employees of the plaintiffs and forcing on the employees and their employers a 'contract' not negotiated between the parties, and by a systematic plan of buying the controlling interest in companies engaged in and related to the coal mining industry; that the defendants the UMW, the UMW Welfare & Retirement Fund, and Cyrus W. Eaton, have knowingly and continuously engaged, and are now engaged in a wrongful and unlawful conspiracy in that the UMW and/or the UMW Welfare & Retirement Fund have used the monies of the UMW and/or the UMW Welfare & Retirement Fund either directly, or through and in collaboration with Cyrus W. Eaton to finance the mechanization of the mines of West Kentucky and to jointly and in concert market the coal thereof: that the defendant, the TVA, acting among others, by and through its Manager of Power, has knowingly and continuously engaged, and is now engaged, in a wrongful and unlawful conspiracy to fix and control prices, eliminate and suppress competition and otherwise control the marketing of coal in the Southern Appalachian coal region; that the defendant, the L&N, has knowingly and continuously engaged, and is now engaged, in a wrongful and unlawful conspiracy by acting together and in concert with the other named defendants. That all of the defendants have been, and are now, acting in concert and that the acts of the conspirators are inextricably interwoven.

"That this wrongful and unlawful conspiracy has been, and now is, in restraint of trade and commerce between the states, has a substantial economic effect on interstate commerce and is in violation of Title 15, USCA Secs. 1 and 2, all to the injury and damage of the public interest and of the plaintiffs.

"That this action is brought by virtue

of, and under the authority of Title 15, USCA Sec. 15.

"That as a result of the hereinbefore set forth conspiracy, the plaintiffs have suffered damage and injury in the actual amount of \$10,000,000 and are entitled under and by virtue of Title 15, USCA Sec. 15, to threefold damages in the amount of \$30,000,000."

The plaintiffs also seek:

"1. Judgment and compensation for their damages and injuries sustained in the manner and in the amount alleged together with interest, cost and reasonable attorneys fee.

"2. That the defendants be perpetually enjoined and restrained from continuing the hereinabove alleged conspiracy.

"3. That the plaintiffs have such other and further relief as the Court may deem just and proper."

In Defense

TVA-C. O. Wessenauer, TVA's manager of power: "There is no conspiracy on the part of TVA or any TVA official. We have to buy at the lowest bid price. We can't see how that is restraint of trade."

L&N RR-W. L. Grubbs, vice-president and general counsel, on Jan. 7, issued this statement: "The L&N has received no formal notification of being made a party to an antitrust suit brought at Chattanooga, Tenn., by 16 coal companies . . . but we are prepared categorically to deny any charge that conspiracy was involved in the recent reduction of rates on coal from West Kentucky to TVA steam plants in north Alabama. The rates mentioned . . . were quoted to TVA in accordance with the authorization given by Sec. 22 of the Interstate Commerce Act. They are on file with the Interstate Commerce Commission and are available for inspection by anyone."

Comment was withheld for the time being by Mr. Eaton and spokesmen for the UMWA and the Welfare Fund trustees.

The Background

TVA business has long been the bone of contention and sparked the filing of the suit by the group from the Sequatchie Valley area (Marion, Grundy and Sequatchie counties, near Chattanooga, which in turn is 40 mi from the Widow's Creek steam plant of TVA).

Lower L&N freight rates from west Kentucky to the Widow's Creek plant were announced in September, 1960. The former rate of \$2.69½ per ton was dropped to \$1.55 to \$1.40, depending on volume. Widow's Creek used 3.6 million tons of coal in 1960, and will up this total substantially in the future. The present

action was forecast by Tennessee operators in protests at the time of the rate reduction.

Other Suits

April 17 has been set by the Federal Court as the starting date for the UMW suit against Phillips Bros. Coal Co., of Scott County, Tenn. Suit was filed by the UMW Welfare Fund for payment of back funds from the firm. The coal firm counterfiled for damages, charging the UMW conspired with big coal companies to drive smaller operators out of business, and also demanded that the UMW be required to list names of persons and firms receiving funds from the UMW Welfare Fund.

Love & Amos Coal Co., Nashville, Tenn., whose senior partner, John Amos, just collected a \$239,000 damage suit claim against the UMW, filed a new suit Jan. 12 for \$1.5 million against the union. The union had delayed since last Oct. 7 payment of the damage claim, which the U.S. Supreme Court upheld on that date. Mr. Amos is also the senior partner of Osborn Mining Co., Jellico, Tenn., which won the federal verdict. The Amos law suit filed Jan. 12 demands damages on two counts totaling \$750,000 each: (1) the union's "reign of terror" against workers of the Osborn Mining Co. caused Love & Amos, which marketed its coal, to lose contracts with TVA. Georgia Power Co. and other firms it supplied; (2) the union's actions were intended to open the way for West Kentucky Coal Co., whose stock it controls, to take over the Love & Amos business.

Bituminous Output

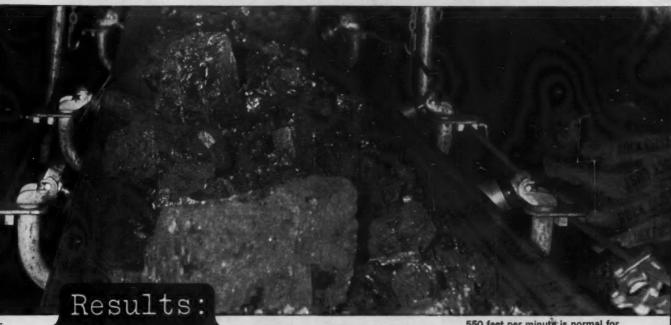
YEA	R TO	DA'	ΓE	PRO	DUCTION
Jan.	14,	1961			14,815,000
Jan.	16,	1960			18,310,000
1961	out	put I	7.1%	behind	1960
WEE	KE	NDIN	G	PRO	DUCTION
Jan.	14.	1961			7,985,000
Jan.	16,	1960			8,825,000

Anthracite Output

YEAR TO DATE	PRODUCTION
Jan. 14, 1961	798,000
Jan. 16, 1960	841,000
1961 output 5.1%	6 behind 1960
WEEK ENDING	PRODUCTION
Jan. 14, 1961	429,000
Jan. 16, 1960	440,000

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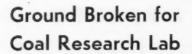
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CENTRAL RESEARCH LABORATORY being built in Monroeville, East Pittsburgh, Pa., will look like this architect's drawing when completed in August of this year.



Construction of the coal industry's new central research laboratory on a 30-acre site in Monroeville, East Pittsburgh, Pa., has been announced by Stephen F. Dunn, president, Bituminous Coal Research, Inc. Mr. Dunn said the construction culminates decisions made last June by the boards of directors of the National Coal Association and BCR, and will permit consolidation of coal's research activities now being conducted in Columbus, Ohio, and Pittsburgh, Pa. Emphasizing development of improved coal utilization methods and equipment, the program will include basic research on the origin, physical

structure and properties, and chemical behavior of coal.

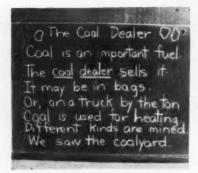
Exclusive of the site and equipment already owned, the building will cost approximately \$675,000 and its total value when completed and equipped, will be in excess of \$1 million. The center is being constructed primarily from coal industry funds with significant financial participation by the electric utility industry, other major coal users and companies supplying material and equipment to the coal industry.

The new research center will be under the direction of James R. Garvey, BCR vice president and director of research. Financial and administrative functions will be supervised by John W. Igoe, secretary and treasurer of administration, who coordinated the financing and planning of the laboratory.



ON SITE of new laboratory, Donald C. Peters, (left), president, Mellon-Stuart Co., contractors, points out development details to John W. Igoe, (center), secretary and treasurer of BCR, and G. Thomas Williams, head of the architectural firm, Williams, Trebilcock & Associates.

To be heated entirely by electricity, the building will include a coal technology library of major importance and an auditorium. The 37,000-sq-ft center will have a brick and stone exterior and wooded campus-type setting. All the foundation concrete, structural concrete, concrete block and bituminous and concrete paving will incorporate the use of fly ash, a byproduct from burning pulverized coal in electric generating plants.



"Black Gold"

The sight of a coal yard sparked the interest of a group of primary-grade school children in Maryland recently during a tour of the community to acquaint them with services available as part of their social studies lessons. They asked the coal dealer such questions as: "Where does it come from?" "How much does it cost?" And one lad remarked: "Teacher says it could be called 'black gold'."

Their teacher Maye King, who submitted these facts and the photo, sought to broaden their appreciation and understanding of coal and its place in modern living. Back in the classroom more facts were sought and samples of the various kinds of "black gold" were brought in. Gradually they saw the coal dealer as an important community service. Now many a lesson paper is decorated with drawings of big chunks of "black gold."

Mine Flushing Program Asked

The next session of the Pennsylvania State Legislature will be asked for \$1 to \$2 million in state funds for the proposed Scranton mine-flushing program.

Daniel H. Connelly, deputy secretary of the Pennsylvania Dept. of Mines & Mineral Industries, originally estimated the cost of the program at \$50 million. However, in the interim, Hudson and Moffat coal companies stopped pumping out mines. Consequently a further engineering study and evaluation of the amount needed to get the project off to a good start, resulted in the sharp downward revision.

WVU Scholar Fund Set

A new scholarship program set up at West Virginia University has been announced by President Elvis J. Stahr Jr. The permanent scholarship is the result of a \$20,000 gift to WVU Foundation Inc. and is named for Frank Ellis Christopher, coal pioneer and father of Mrs. Virginia Christopher Farland who established the program.

First annual scholarship will be awarded in the fall of 1961 to a male West Virginian studying mining engineering or a related subject, or to the son of a coal mining family. The grants will be renewable and the same student may receive the scholarship as long as he meets university requirements.





THE LARGEST FILTER ever manufactured for the coal industry, according to its builder, has been installed by the Clinchfield Coal Co. at its Moss Mine No. 3 in Russell County, Va. It was fabricated for Peterson Filter & Engineering Co. by the Graver Tank & Mfg. Co., Salt Lake City.

The filter has 14 rotary discs that measure 12 ft 6 in in diameter. Overall length is 27 ft. Completed weight is some 23 tons and static area is 3,080 sq ft, equivalent to a small house. In operation the equivalent operating area will be over 2,750 sq ft and the filter will handle refuse at a rate of 75 to 100 tph. The filter will be used to increase the amount of very fine clay refuse going to the gob pile, thereby extending the life of the impounding area at Moss No. 3.

National Fuels Policy Proposed

A task force on natural resources, headed by Rep. Frank E. Smith (D-Miss.), submitted a report last month to President John F. Kennedy for a conservation and development program that would include federally produced nuclear power. It also proposed a long-range national "energy and fuels policy" that would insure "abundant electricity at minimum cost to the ultimate consumer." The report, prepared by his Natural Resources Advisory Committee, made the following proposals on power:

"Long-range energy resource development objective based upon forecasts of need and the public interest should be established by the Federal Government.

"A national energy and fuels policy to guide Federal agencies responsible for resource development should be enacted by Congress to provide:

"1. progressive evaluation standards for multiple-purpose projects;

"2. cost allocation formulae for multiple-purpose projects which are consistent with the principle of regulation by competition;

"3. abundant electricity at minimum cost to the ultimate consumer, whether he is served by investor-owned, local public or cooperative distribution systems; "4. fully adequate conservation of nonrenewable energy sources.

"The Dept. of the Interior, in cooperation with other agencies, must reassert its responsibility to provide long-range planning of generation and transmission facilities to meet future needs, with immediate attention to the economic necessity of inter-regional Federal transmission ties.

"Wholesale Supply Systems

"Regional wholesale power supply systems should be made responsible for meeting the expanding wholesale power requirements of all retail electric systems at the lowest possible cost and supplied with as much hydroelectric capacity as is economically feasible for low-cost peaking power and reserve capacity.

"Falling water, coal at the mine mouth, atomic energy, or even solar energy could supply the fuel, depending upon conditions in various regions. Because our supplies of coal are plentiful and often more useful when converted to electricity, an important part of the power should be 'coal by wire' from the now-depressed mining areas in West Virginia and Pennsylvania and the coal and lignite deposits of the West.

"Atomic power, developed and financed by the people, should be made available from Federal nuclear plants as soon as production costs can be materially reduced."

BCR Proposes Research Projects

A proposal for research projects has been submitted to the newly-created Office of Coal Research in the Dept. of the Interior by Bituminous Coal Research, Inc., on behalf of the coal industry.

Of the 27 projects up for consideration, 12 are aimed at expanding coal utilization in present markets, nine are designed to develop new markets for coal, and six deal with improved methods of mining and preparing coal. Most involve a research program of at least 2 yr duration.

Canal to Serve Coal Areas

A canalization project on the Kaskaskia River in Illinois, costing \$60,500,000, has cleared its first major hurdle, according to Rep. Kenneth J. Gray (D—III.). The army corps of engineers division office, Vicksburg, Miss., approved a feasibility survey calling for canalization of the river from a point near Chester to Fayetteville, a distance of about 55 mi.

Joining the Mississippi near Chester, the Kaskaskia River cuts across coal bearing areas of southwestern Illinois. Rep. Gray said the canal would serve existing and proposed coal mines and provide a spark for locating heavy industry in the area.

To be 9 ft deep and 200 ft wide, the canal would require only one lock and dam 4 mi from the mouth of the Kaskaskia.

If approved, the project would cost the federal government \$58,200,000; the state would pay \$2,300,000 plus the cost of relocating or removing seven railroad and highway bridges. Although the project is expected to be brought before congressional committees in March, and approved, passage may require as long as 2 yr if Congress decides to include it in an omnibus rivers and harbors bill, as is the custom.

Consultants Associate

Warren H. Hinks Jr., mining standards consultant, Johnstown, Pa., and Victor L. Hurley, mine operator and management consultant, Charleston, W. Va., have announced their association under the name of "Hurley & Hinks," mining production consultants. Specialized services include mine production surveys, mining equipment studies, mine management, time studies, cost control systems, etc.

We put a lot of work into it You get a lot of work out of it



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ENERGY...

vs. Mechanical Energy

Cheaper blasting materials and improved drilling equipment have reduced the cost of explosives energy to the point where it is doing work formerly reserved for mechanical equipment. By putting more of this low-cost explosives energy to work, machinery operates more efficiently, costs are lowered all along the line.

Smart, profit-minded operators are taking a closer look at the cost of mechanical energy vs. explosives energy and they are coming up with important savings in machinery, manpower, and time—for example:

In coal stripping, explosives force is used to move up to 50% of the overburden directly on to the spoil pile. Mechanical handling costs are reduced, and coal is uncovered more rapidly.

In open pit ore mining, explosives factors are being designed to gain additional fragmentation. Much of the material by-passes the primary crusher. Production is speeded, overall costs lowered.

In quarrying and construction, operators are finding it no longer pays to blast rock just hard enough for equipment to handle it. They are taking advantage of lower drilling and blasting costs to gain more fragmentation and displacement. And in the process they are making important savings in wear on crushers, dipper teeth, wire rope, and truck bodies. They

are reducing operating costs, eliminating production delays.

The economics of drilling and blasting have changed. Looking for ways to reduce blasting costs alone is not enough. The real savings come when you look at explosives energy as a way to reduce overall operating costs.

For a closer look at some of the ways explosives energy can lower your costs all along the line, look to Atlas' full line—the only full line in the industry. Expanded plant facilities are now in production at Joplin, Missouri to assure ready availability of all products. And to give you faster, more flexible local service, new distribution facilities are being established coast to coast. Call in your Atlas Representative. His experience with the newest advances in explosives, blasting agents, and blasting techniques can help you measure the relative economy of explosives energy vs. mechanical energy in your operation.

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News Roundup (Continued)



AN INTERNATIONAL LABOR ORGANIZATION technical meeting to study the social consequences of the crisis in the coal mining industry took place last month in Geneva, Switzerland. The U. S. delegation, pictured here, consisted of (l. to r.) Paul K. Reed, special international representative, UMWA; Harry Weiss, executive director, Manpower Administration, Dept. of Labor; and Stephen F. Dunn, president, NCA. Management, labor and government delegates from six other major coal-producing countries also attended the meeting to consider the social consequences of declining coal production and diminishing employment of miners in major coal-producing countries, and make recommendations to the governing body of ILO.

The Gift of Gob

It now seems that the disfiguring mountains of debris from underground coal mining, descriptively called "gob piles", may not be all evil. Research, by the Upper Ohio Valley Development Council, on working over the gob and separating it into various constituents indicates these tailings may furnish employment and supply valuable materials for other industries.

Gob is not standardized and it is probable that the constituents and their values will vary widely. A 5-ton lot of representative gob will furnish sizable amounts of alumina, aluminum sulphate, iron oxide and powdered coal, and about 2 tons of clean sand. As often happens, research leads to industrial construction and in this case, developers of the process plan a plant in Belmont County, Ohio, at the coal mining village of Powhatan Point.

Twin Generator

The second of the world's largest steam-electric generating units was placed in commercial operation Dec. 31 at the Philip Sporn Plant of the American Electric Power System on the Ohio River at Graham Station, W. Va.

Owned by Ohio Power Co., the new 500,000-kw, \$65 million unit is the twin of another AEP System unit operating since last July at Indiana & Michigan Electric Co.'s Breed Plant on the Wabash River in Indiana. Begun in 1957, the new unit boosts Sporn Plant's capability to 1,100,000 kw and increases capacity of the AEP System to 6,500,000 kw.

Its water-cooled generators, designed and built by General Electric Co., are reported to be the world's largest of their type. The turbines receive 3,000,000 lb of steam per hr at 3,500 lb per sq in from a Babcock & Wilcox steam generator. Steam at an initial temperature of 1,050 F and double reheat temperature also of 1,050 F is provided by the 23-story boiler. At 3,500-psi pressure,

the Sporn Plant unit is well above the critical pressure level of steam—3,206 psi. Its heat rate is expected to be close to 8,500 Btu per kwhr.

Coal Research Group Chosen

A 14-man general technical advisory committee was appointed last December by former Interior Secretary Fred A. Seaton for the new Office of Coal Research. Authorized by Public Law 86-599 and approved by former President Eisenhower last July, the Office of Coal Research has two important responsibilities in expanding the use of coal: To contract for research when it is satisfied it can get the job done best, and to emphasize short-term projects to improve the economic position of the industry as soon as possible.

The committee will exercise consultative functions in connection with administration of the Act and will assist in evaluation of research projects.

The 14 representatives chosen from various segments of the Nation's coal industry are: G. A. Shoemaker, president, Consolidation Coal Co.; Raymond E. Salvati, president, Island Creek Coal Co.; Harry LaViers, president, South-East Coal Co.; F. S. Elfred, chairman of the board, Peabody Coal Co.; Philip Sporn, president, American Electric Power Co.; Michael F. Widman Jr., director of marketing and research, UMWA; Stuart T. Saunders, president, Norfolk & Western Ry.; Dr. H. B. Charmbury, head, Dept. of Mineral Preparation, Penn State University; Dr. R. G. Spindler, dean, West Virginia University; Walter K. Scherer, president, Fred Scherer, Inc.; J. D. Jillson, president, Anthracite Institute, Inc.; Maurice H. Bigelow, technical director, Allied Chemical Co., Plastics & Coal Div.; Samuel Lenher, vice president, research and development, E. I. du Pont de Nemours & Co., Inc.; and W. L. Wearly, president, Joy Mfg. Co.

Enos Acquires Blackfoot Mine

Enos Coal Mining Co., with headquarters in Cleveland and mining facilities in Indiana, has announced acquisition of Blackfoot mine, Pike County, Ind., from Blackfoot Coal & Land Corp.

With a production capacity of 750,-000 tons per yr, the Blackfoot addition increases total annual capacity of the Enos mines to 3,000,000 tons.

Enos and its exclusive sales agent, Pickands Mather & Co., have entered into a long-term contract with the Indianapolis Power & Light Co. to furnish the utility's Indiana generating stations with a minimum of 700,000 tons of coal annually. Total coal requirements of the Edwardsport and David generating stations owned by Public Service Co. of Indiana are also supplied under long-term contract by Enos mines.

W. J. Crawford, Emos vice president in charge of operations, will also be in charge of the Blackfoot operations. Leland Morrison, long connected with Blackfoot, will become superintendent of the Blackfoot mine. John A. Stachura, vice president of Enoco Collieries, Inc., a deep-mining subsidiary of Enos, is in charge of the Enoco operations.

Preparation Facilities

New River Co., Summerlee Mine, Summerlee, W. Va.—Contract closed with Fuel Process Co. for an M-7 heavy media coal washer with accessories for a heavy media coal washing plant addition to handle 8x¾6. Capacity of plant is 300 tph and ROM capacity of washer is 190 tph for 8x¾6. Completion, April 15.

Lady Jane Collieries, Pennfield, Pa.—Contract closed with Williams & Green for complete cleaning plant, with 800 tons of storage and multislate ejector system, to handle 1½x0 coal at 150 tph. Completion, Feb. 15.

People in Coal

Industry Leader Awarded AIME Medal



DONALD MARKLE, president and chairman of the board of Jeddo-Highland Coal Co., Jeddo, Pa., has been awarded the Erskine Ramsay Gold medal by the American Institute of Mining, Metallurgical and Petroleum Engineers. Presentation of the medal, which recognizes distinguished achievement in coal mining, will take place March 1st during the Institute's 90th annual meeting in St. Louis.

Born in Hazleton, Pa., and a graduate of Yale, Mr. Markle studied mining at Lehigh University and then took a position as assistant mine foreman with Lehigh Coal & Navigation Co. His notable service in World War I brought him the Purple Heart, the Verdun Medal and a Citation from General Pershing. Following the war, he was a special engineer in charge of research, preparation and use of fine sizes of anthracite with Hudson Coal Co. In 1921, Mr. Markle and his associates formed the Fuel Service Co. with offices in New York City. He went to Jeddo in 1926 as president of Jeddo-Highland Coal Corp.

Mr. Markle introduced in the anthracite region tables for the cleaning and preparation of fine sizes of anthracite and developed and patented a new fuel—"Anthracoke." He conceived the idea of improving the structure of metallurgical coke by using anthracite fines as an additive to bituminous coking coal.

A director of Virginia Coal & Iron Co., General Coal Co., Stonega Coke & Coal Co. and the Anthracite Institute, Mr. Markle also heads the Raven Run Coal Co.



John J. Foster, former vice president—public and industrial relations, Island Creek Coal Co., retired last month, bringing to a close a career of over 50 yr with the company. He will remain active in company affairs on a consulting basis. In recognition of his many public and industry services, the new National Guard Armory, Monaville, W. Va., dedicated on Jan. 10, was named in his honor. Mr. Foster first began his employment with Island Creek during summer vacations while attending Marshall College, in Huntington, and upon graduation in 1908, started as a clerk and even-

tually advanced to general manager of operations at Holden, W. Va. He was transferred to Huntington in 1948 as assistant to the president and in 1952 was elected vice president.



Cecil H. Underwood, ex-governor of West Virginia, became a vice president of Island Creek Coal Co. Feb. 1. His new duties will include responsibility for many of the company's public relations activities and his headquarters will be in the firm's executive offices in Huntington. Prior to his election as governor at the age of 34, Mr. Underwood had

served six terms in the W. Va. House of Delegates. He was minority floor leader for four terms. In 1960 he was Republican nominee for the U. S. Senate. A graduate of Salem College and West Virginia University, Mr. Underwood was a member of the executive committee of the National Governors' Conference in 1958-59, and a member of the Conference's Committee on Federal-State Relations in 1959-60. Mr. Underwood replaces John J. Foster.

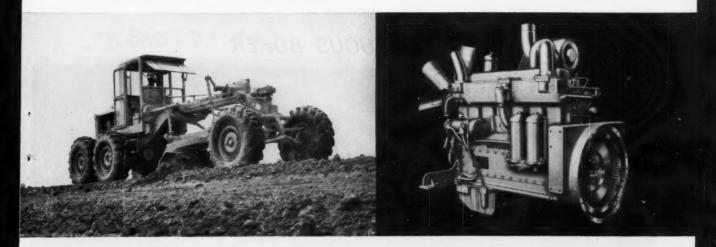
Eastern Gas & Fuel Associates has announced three promotions of supervisory personnel at its W. Va. mines. R. W. Thomas, formerly resident engineer at the Kopperston Mine, Kopperston, has been promoted to superintendent of Stotesbury No. 10 Mine at Helen, succeeding K. S. Hobbs. Mr. Hobbs was transferred to the Stores Div. as assistant to the general manager at Huntington. E. P. Sheriff, formerly resident engineer at Keystone Mine, Keystone, has been appointed resident engineer at Kopperston. W. W. Mabe, formerly transitman, has been moved up to resident engineer at Keystone Mine, Keystone.

Dr. Harold J. Rose, retired vice president and director of research of BCR, has joined the Nuclear Science & Engineering Corp., Pittsburgh, as consultant.

(Continued on p 50)

NEW CAT NO. 14 SERIES C MOTOR GRADER

Compact engine plus many other refinements assure top performance, easier servicing, long life



Important changes make up the new Series C No. 14 Motor Grader—big improvements throughout to give you better performance, long life and servicing ease:

NEW COMPACT 150 HP ENGINE The short, rigid block and stress-relieved crankshaft give greater strength and shock resistance. New cylinder head design resists distortion yet has superior cooling characteristics. Large water pump with cast-iron impeller, ceramic seal face, and carbon type seal combined with a 20 per cent increase in radiator capacity improves cooling, lengthens life.

NEW STARTING ENGINE All-weather starting with this new two-cylinder vertical gasoline engine is assured. Replacing the horizontal engine, this design features aluminum pistons and overhead valves for improved performance. Bore is 2.38", stroke is 2.38", and compression ratio is 8:1. Over-running clutch in starter pinion prevents damage to starter engine when diesel starts, a year-round starting plus.

NEW SERVICING EASE An advanced fuel system is designed for easier servicing and more efficient operation. Compact fuel injection pumps with barrel and plunger assemblies enclosed in housing help reduce wear, lengthen service life.

Plus all the features that made the No. 14B the most versatile motor grader in the "big machine" field . . .

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DRY-TYPE AIR CLEANER —removes 99.8 per cent of all dirt from intake air. Can be serviced in five minutes.

MECHANICAL CONTROLS —provide easy engagement. "Anti-creep" lock makes blade stay put under load.

FULL VISIBILITY —operator has unobstructed view of job even while seated.

Now, all Cat Motor Graders feature the compact engine. Like the new No. 14C, the 85 HP No. 112E, the 100 HP No. 112F, and the 115 HP No. 12E are all designed to give you the highest production at the lowest possible cost. Your Caterpillar Dealer can give you the facts and figures. He can prove it both on paper and on your job. Call him today.

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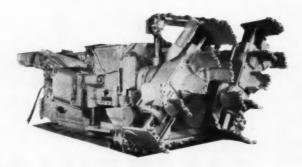
Extra productivity

... CONTINUOUS BORER



Goodman borers are rugged machines that have all the capacity, power and practical mobility needed for any phase of development work, room driving and pillar recovery. They are consistently developing areas at a rate of advance ranging from 200 to 300 lineal feet per machine shift; are producing tonnages in excess of 90 tons per face man for an entire mine. Low maintenance has been outstanding-at one mine a borer produced over one million tons of coal without need of an overhaul. At another property, six borers worked steadily for 2 years without an overhaul date even being scheduled.

This high tonnage, low down-time combination is built into every Goodman borer. It keeps men and machines at the working face-produces more coal with less supervision, makes the capital invested look better with each production report.



Goodman borers cut a path with arched rib and roof for natural support, produce a high percentage of coarse coal for maximum dollar yield.

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Use Genuine Goodman Replacement Parts

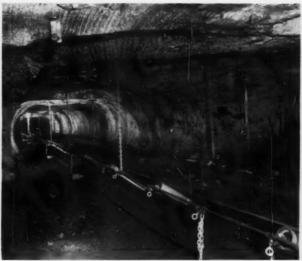
with GOODMAN EQUIPMENT

at low cost per ton

... SHUTTLE CAR





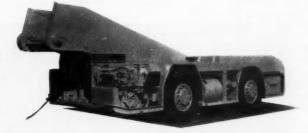


NEW—Now for big hauls use Goodman 1070 AC 10-ton shuttle car with 80 hp traction motor and a 26 hp motor for conveyor drive and hydraulic system. There are two tramming speeds without the use of clutches and torque converter . . . simple electrical, mechanical and hydraulic systems. Planetary type wheel units lessen wear on tram mechanism and produce high torque at wheel hub where needed. 10-ton capacity can be increased with sideboards.

Practical for use anywhere in your mine—development headings, production panels, on main line or slope. Whatever its application, ground mounted or roof suspended, it pays off in speed of installation, high capacity, and low maintenance. Superior carrying capacity is particularly important for accepting coal from shuttle cars servicing continuous miners, and for mainlines that carry a mine's total production. Entire Ropebelt units can be quickly recovered and reinstalled.

The 1070 is available in basic heights of 44" and 49" and widths of 96" and 106". Ground clearance is 1116".

Two improved Goodman full-flex carrying idlers available—the full-flex linked type, and full-flex low rope type that raises wing rollers above wire ropes (illustrated). Carrying capacity of both increases under load.





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A complete line of equipment for continuous and conventional mining systems.

NOLAN Efficiency Products for Coal Mining



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Traction, Gear and Chain Drive



CAR FEEDER-RETARDER

Complete Trip Control Up or Down Grades
No Jerking—No Dog Wear



HYDRAULIC PORT-A-FEEDER

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Hydraulic—with Simplified Electrical Control. Mechanical—with EZ Tilt Pan.



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Positive Trip Control—No More Skids for Down Grades—Adjustable Braking and Holding for All Conditions.



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THE NOLAN COMPANY

116 Pennsylvania St.

Bowerston, Ohio

Coal Abroad

Emergency Program Agreed Upon

An emergency program to meet problems of the European energy market has been agreed upon by the executive bodies of three European communities — the Common Market, Coal & Steel Community and Euratom, according to an announcement by high authority of Coal & Steel Community. A result of compromise between the Common Market and the Coal & Steel Community, whose differences prevented agreement for the past few months, the program contains the following measures:

1. Harmonization of commercial energy policies of the six member countries. This would provide that member countries inform each other before commercial or supply agreements are negotiated with countries outside the community. The countries would also be expected to keep each other informed about customs regulations regarding various fuels.

2. Elimination of differences in competitive conditions between coal and oil products in the six-nation community. Since coal producers are obliged by community treaty to publish price schedules and not discriminate among customers, this could mean oil companies would be obliged to do likewise.

3. Adoption of a safeguard clause which would allow a series of emergency measures should the market situation worsen. The point at which these measures would go into effect is being decided by the interexecutive working group on energy of the three communities.

ECSC Production Climbs

Coal production of the six European Coal & Steel Community countries climbed to 20,333,000 metric tons in November, a 44% rise over October and a 1% increase from November, 1959, tonnage.

Production of individual member countries amounted to 12,340,000 tons for Germany, 4,787,000 for France, 2,011,-000 for Belgium, 1,135,000 for the Netherlands and 60,000 for Italy, as reported by the ECSC spokesman in Luxembourg.

Total ECSC production for the first 11 mo of 1960 was 214,184,000 tons or 3/10% under the corresponding period of 1959. The reduction is due exclusively to a slowdown in French production since French mines felt the impact of

the coal crisis 18 mo after Belgium and Germany.

Overseas Flashes

GREAT BRITAIN—Output in 1960 fell almost 13 million long tons below that in 1959 but exports increased substantially. Production for the 52 weeks ending Dec. 31, 1960, totaled 193,734,300 long tons as against 206,108,500 long tons for the 52 weeks ending Jan. 2, 1960. Exports reached 5,167,000 long tons by Dec. 24, 1960, compared with 3,752,000 long tons at the same time the previous year. Pithead stocks fell to 29,844,000 long tons by Dec. 24, as against 36,153,000 in 1959.

Alfred Robens, National Coal Board chairman, said he expected the coal industry to be "in the black" instead of in the red within the next 2 yr. He said he will aim to ensure a sale of 200 million tons a year. Sales, he noted, would be likely to vary between 192 and 208 million annually and this variation would be covered by the stocks. "Big administrative changes of a policy character" which would mean more freedom for divisional boards with 'greater control at the periphery and less at the center" are proposed by Robens.

JAPAN—The Ministry of International Trade & Industry has authorized a study of relations between the Japanese coal industry and petroleum imports. There is growing apprehension in government circles that the current coal industry rationalization plan will not make domestic coal competitive because of falling world oil prices. The problem could become critical since the Japanese government is pledged to eventually drop import restrictions on crude oil as part of the program to remove exchange controls.

WEST GERMANY—Hard coal production (including the Saar) for 1960 will amount to 142.3 million tons, a 600,000-ton increase over 1959, according to preliminary estimates. The slight increase was facilitated by the German industrial boom in combination with increased exports which climbed to 28.7 million tons in 1960 from 25.9 in '59. Coal imports decreased from 7.54 million tons in 1959 to 7.24 in '60. As a result, German pithead stocks underwent a welcome slimming cure from 17.88 million tons at the end of 1959 to 11.76 at the end of 1960.

O-B Designs for Mining Men

RESULT:Better working conditions

for men and equipment

*A quick, easy-to-use support for cables, conduit and pipe.

The O-B roof plate hook installs with one hammer blow.

- CLEARS MINE BOTTOM FAST AND EASY ... cables, conduits and pipe go out of the way overhead leaving a clear way underneath for men and machines.
- PROTECTS ITS LINES FROM DAMAGE . . . saves costs because cables and other such valuable linage are held out of the way of wheels and feet.
- THESE HANDY HELPERS CAN BE USED OVER AND OVER AGAIN... once a section has been worked out... roof plate hooks can be reclaimed as easily as they were installed. This easy-to-use support moves with your operation! Order them from your O-B representative when he next stops at your mine. O-B Roof Plate hooks will make your mine operation safer and faster.

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HOLAN

EXPANSION SHELLS AND PLUGS . LINE MATERIALS . SAFET AND CONTROL EQUIPMENT . ELECTRIC HAULAGE MATERIAL

Save on construction costs with the new '61 FORD TRUCKS

NEW SUPER DUTIES CUT OPERATING COSTS, GIVE PROVEN DURABILITY THAT'S BACKED BY A 100,000-MILE ENGINE WARRANTY

New 100,000-mile warranty on Super Duty V-8 gas engines is the most liberal in the industry. On 401-, 477- and 534-cu. in. V-8's, Ford Dealers will replace any major engine part (including block, heads, crankshaft, bearings, valves, pistons, rings) found to be defective in materials and workmanship providing trucks are used in normal service. The warranty covers full cost of replacement parts for 100,000 miles or 24 months, whichever occurs first . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter. Never before have you had such protection . . . such evidence of long-term durability!

And you save with greater gas economy! Certified tests prove the new Super Duty V-8's give up to 20% better mileage. In addition, Ford's new lightweight, extra-hi-tensile single-channel frames (standard F-850—F-1000) give you long-lived durability combined with a lightness of weight for added

payloads. All in all, you get proven components and design features . . . in trucks built for easier maintenance and lower running costs.

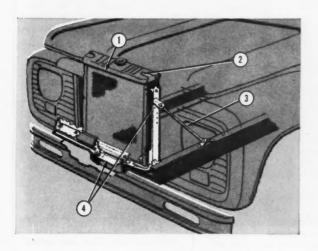
Save with Ford T-Series Super Duty Tandems for exceptional durability, big payloads and low operating expenses. Ford T-850 and T-950 Tandems with Super Duty V-8 engines have rugged double-channel, hi-tensile frames for maximum strength, minimum weight. And they provide a wider range of chassis options so you can choose the right power train and load-carrying components for any job. Eaton and Timken rear axles are now available in bogie assemblies with up to 38,000-lb. capacity. And lightweight aluminum walking beams, wheels and gas tanks are available to keep chassis weights low . . . payloads high.

Ask your dealer about Ford's full tandem line . . . five T-Series with GVW's ranging from 28,000 lb. to 51,000 lb. and GCW's up to 75,000 lb.

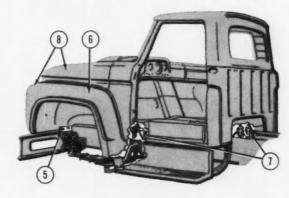




SAVE WITH NEW HEAVY-DUTY CONSTRUCTION THAT DOUBLES CAB, SHEET METAL AND RADIATOR LIFE



- Save with Ford's exclusive "lock-seam" radiator construction that doubles the solder area at key seams for greatly increased strength and longer radiator life.
- Save with heavier-gauge metal on radiator tank and header. Tanks and header have thicker walls to resist vibration, jolts and corrosion for greater reliability.
- Save with independent radiator mountings, separate from front-end sheet metal. This means that road shocks and shakes are not transmitted to the radiator through sheet metal . . . tanks, tubes and connections last longer, require less maintenance.
- Save with "horse collar" mounting for extended radiator life. This new mounting on resilient rubber at the center of frame cross member soaks up any frame flexing ... cuts wear and tear on entire cooling system.
- Save with independent fender mountings. Fenders are bolted to a rubber-cushioned transverse bracket at the front and a frame-mounted bracket at the rear. This mounting, independent of both cab and radiator, eliminates stress transfers for increased fender life.



- Save with removable fenders. The quick and easy removal of only 8 bolts per fender provides faster service accessibility to the engine area, saving valuable maintenance time.
- Save with new 3-point cab mounting system for greater cab durability. Two outboard front mounts plus a centered "twin" rear mount provide a triangular system that holds the cab stationary while allowing the frame to move independently . . reducing strain on the cab.
- Save with 42% heavier-gauge sheet metal in fenders, hood, cab floor pan and toeboard for greater strength, greater durability.



Save with Ford's new Full-Torque flywheel power take-off . . . now available on T-750's and up, to power construction equipment like transit mixers. It's much simpler and more efficient than long, complicated hookups needed with the front-end drives. And the flywheel PTO is lighter in weight—only 105 pounds—for greater payloads.

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Rubber of Neoprene
 REPLACEABLE Segments
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 Small Medium or Large
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VULCAN AUTOMATIC OR PUSH BUTTON OPERATED HOISTS

Now economical for production in small mines or man service large in mines. Catalog No. AC 6002



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Built-in air and waterlines remote control valve stations.

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MEEHANITE CASTINGS CUSTOM FABRICATIONS

Special Designs of All Equipment

DORR-DLIVER INC. Stanford Coop.

Current Coal Patents

Oliver S. North Patent Research and Abstracting Washington, D. C.

Screening machine, K. Muller, Dec. 20, 1960. Design for an improved horizontal vibratory screen body having two counter oscillating masses which incorporate a plurality of components having means for varying the angle of throw with respect to the adjacent screen. Thus, when screening coal the angle of throw can be lowered to obtain increased output and reduced breakage of the coal. No. 2,965,233.

Bit and resilient holding means therefore, C. B. Krekeler (assigned to Cincinnati Mine Machinery Co., Cincinnati, Ohio), Dec. 20, 1960. Improved resilient means capable of being used in a wide variety of ways with the shanks of cuter bits and cutter bit holders. The resilient means is easy to install and replace, and does not complicate the structure of either the shank or the socket member. No. 2,965,365.

Flexible troughing roller assembly for a belt conveyor, M. A. Gleeson (assigned to Goodman Mfg. Co., Chicago, Ill.), Dec. 27, 1960. Design for a lightweight conveyor belt troughing roller assembly having great strength and flexibility, and which can be readily assembled and disassembled for maintenance and repair. Although any number of rollers can be employed, it is preferable to use at least three. No. 2,966,255.

Lignite processing method, H. G. Lykken, Dec. 27, 1960. In the production of a stable, moisture-resistant fuel product, coarsely crushed and screened raw lignite is fed with a minor amount of a fluid hydrocarbon into and through a rotary preheater and then a rotary kiln wherein it is heated to about 600F.

The fines are agglomerated, and the agglomerates given a varnish-like coating and cooled. Additional liquid hydrocarbon is introduced into the cooling zone. No. 2,966,400.

Coming Meetings

International Symposium on Mining Research, Feb. 22-25, 1961—University of Missouri, Rolla, Mo.

AIME Annual Meeting, Feb. 26-Mar. 2, 1961—Ambassador and Chase-Park-Plaza Hotels, St. Louis, Mo.

Fourth Symposium on Rock Mechanics, Mar. 30-April 1, 1961—Pennsylvania State University, University Park, Pa.

Sixth Annual Minerals and Petroleum Conference, Southwestern Alaskan Chapter, AIME, April 7-9, 1961 —Anchorage, Alaska.

Twelfth Annual National Conference and Convention, May 11-13, 1961 — Sheraton Cadillac, Detroit, Mich.

Sixth Annual Appalachian Underground Corrosion Short Course, June 6-8, 1961—West Virginia University, Morgantown, W. Va.

Rocky Mountain Coal Mining Institute Meeting, June 25-28, 1961— Hotel Colorado, Glenwood Springs, Colo.

International Briquetting Association Conference, Aug. 28-30, 1961— Jackson Lake Lodge, Jackson, Wyo.

National First-Aid and Mine-Rescue Contest, Oct. 2-4, 1961—new Public Auditorium, Pittsburgh, Pa.

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS INCLUDING URANIUM & LIMESTONE — ANYWHERE

FOUNDATION TEST BORING . GROUT HOLE DRILLING

Skilled crews and complete stock of core drills and accessory equipment maintained at all times

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Continuous Miner Operator—Kennametal Representative—Mine Foreman

3-man team at mine face studies ways to cut costs

Kennametal Representatives provide real service—the kind that cuts your operating costs. These Kennametal men have from 16 to 45 years of practical experience, as mine supervisors and field service engineers. Each is a specialist in solving carbide bit problems.

The Kennametal man will work with your mine foreman and machine operator to determine the nature of your cutting or drilling problem. He will then recommend the right carbide bit for conditions in your mine.

Upon request, he will help your machine opera-

tors get the best from the tools. And if desired, he will conduct, or assist in conducting, tests to evaluate performance in actual operation.

As an additional service, he will help you get top bit performance at lowest possible bit cost, through correct usage and reconditioning of Kennametal* carbide mining tools.

To get these services, call your Kennametal Representative or contact us direct. Kennametal Inc., Mining Tool Division, Bedford, Pennsylvania. Phone 623-5134.

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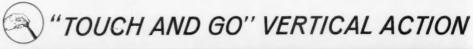
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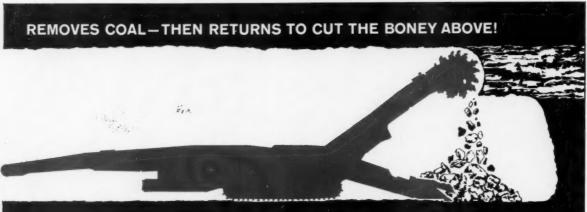




SELECTIVE MINING ABILITY DELIVERS CLEANER

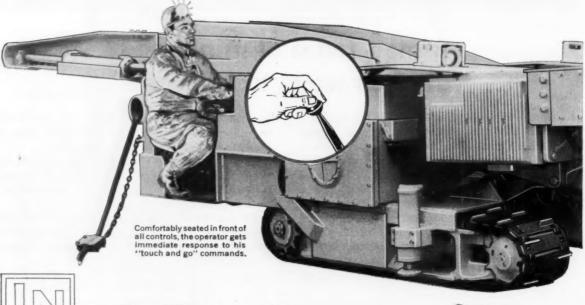
Lee-Morse CM38





The Selective Mining capacity of the Lee-Norse Miner means a cleaner product delivered to the tipple with a resultant reduction in preparation costs.

Using this method the Miner first mines the coal-then by "touch and go" command the cutters speedily raise upward to cut the rock or boney.





Lee-Norse Company CHARLEROI, PENNA.
SPECIALISTS IN COAL MINING EQUIPMENT

Coal High or Low?... Lee-Nouse MINERS keep production on the go!

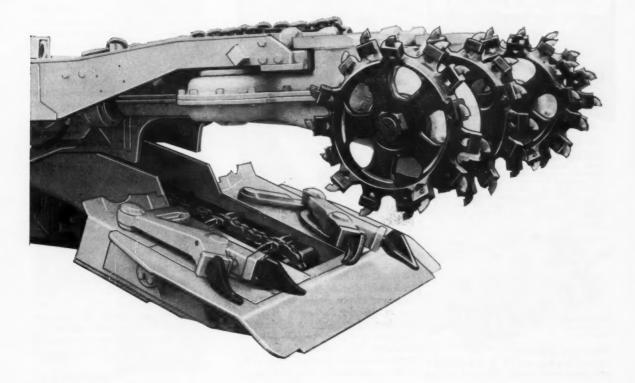
COAL ... CUTS COSTS

and CM48 MINERS

gives the Lee-Norse Miners these 3 features:

1. SELECTIVE MINING ABILITY
2. TRAMS LOW—CUTS HIGH
3. CONTROLLABLE CUTTING HEIGHTS

"Sweeping" up the unwanted material, the Miner loads it separately into cars for haulage to the disposal area. "Touch and go" vertical control enables a hundred per cent extraction of high and low coal seams from 42 inches to 120 inches.



Cut Your Strip Mining Costs with a HOSSFELD PROSPECTING DRILL

ACTUAL field runs prove that prospecting costs can be cut with this fast working machine due to its many economical working features and quick setup time. Samples are taken continuously while drilling to accurately determine type of formation, and depth of vein or ore body, up to 110 feet deep.

- POWERFUL DIRECT DRIVE
- ONE MAN OPERATION
- ECONOMICAL 5 H. P. GASOLINE ENGINE, AIR COOLED
- LIGHT WEIGHT COMPACT PORTABLE



Designed to fold into a half-ton pickup, trailed in the field on its own chassis, or dismantled for easy packing over rugged terrain.

WRITE TODAY . . . for illustrated bulletin "Take the guesswork out of Mining"



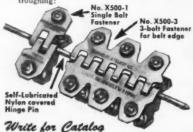
HOSSFELD MFG. CO.

440 W. 3rd Street, Winona, Minnesota

for Conveyor Belts
that must be
extended or shortened

Recommended for mines, quarries, construction work, storage yards — wherever belta length must be frequently changed. Hinged Plategrip Fasteners make a strong, flexible joint in heavy duty conveyor belts, trough naturally, ride smoothly over pulleys, yet can be separated by simply pulling the hinge pin. Improved design takes the new smaller diameter self-lubricating nylon sheathed cable hinge pins. No. X500-1 single bolt fasteners and No. X500-3 bolt fasteners (used at outside edges) to reinforce edges and aid troughing:

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ARMSTRONG-BRAY & COMPANY

5340 NORTHWEST HIGHWAY . CHICAGO, ILLINOIS

People in Coal (Continued)



James D. Reilly, vice president, Hanna Coal Co., Adena, Ohio, was honored Oct. 22 in Paris, France, when the French Government bestowed upon him its highest civilian decoration—the Red Ribbon of France, making him a Chevalier in the French Legion of Honor. President M. Thibault, of the Iron Ore Syndicate of France, presented the ribbon, given only to those who have made outstanding contributions to France. Mr. Reilly's contribution dates back to just

after World War II when the French were seeking advice on adapting American methods of management to their various fields of activity. Three members of the French delegation became interested in Mr. Reilly's theory that modern mining equipment needs to be coupled with a human relations program to achieve higher productive efficiency. The program was put into effect in France and resulted in a considerable increase in efficiency in the iron ore mines, an increase in the number of ore mine employees who own their own homes and a decrease in the number of dues-paying members of the Communist Party in the mining section.

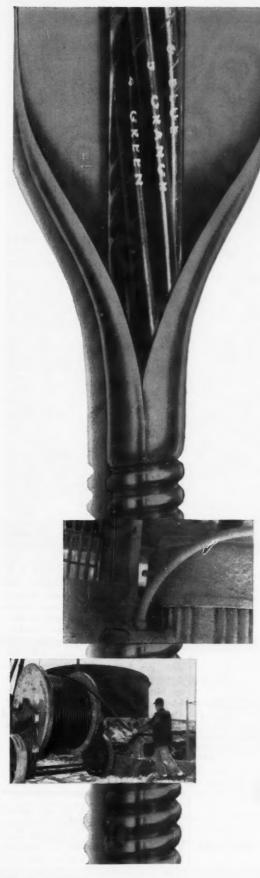


William Bellano has been named executive vice president of Glen Alden Coal Corp., Wilkes-Barre, Pa. Before joining Glen Alden, Mr. Bellano was president and chief executive officer of Gulf Sulphur Corp., Houston, Tex. Earlier, for a 6-yr period, he was vice president of engineering for the International Minerals & Chemical Co. of Chicago.

George L. May has been named division superintendent of the Cambria Div., Bethlehem Mines Corp., succeeding Jerome C. White who is retiring. Also announced was the appointment of C. J. Hannigan as chief engineer. Mr. Hannigan replaces retiring Charles S. Cressman. Robert H. Marks has been promoted to chief chemist, a post formerly held by Chester E. Watts, also retiring.

E. H. Roberts has been assigned the post of mine superintendent, underground operations, of Inland Steel Co.'s mines at Wheelwright and Price, Ky. Mr. Roberts has been with the company since 1950 during which time he has held the positions of superintendent of underground maintenance, mining engineer and others.

(Continued on p 52)



Only C-L-X Sealed Cable Systems by Simplex Can do so Many Jobs so Well

Simplex C-L-X is a packaged combination of cable and an extremely pliable, corrugated metal sheath. It requires no separate duct or conduit regardless of environment. It is available with steel sheath and plastic jacketing; and with copper or aluminum sheaths, with or without plastic jacketing.

C-L-X Cuts Installation Costs

By using a single length of 3-conductor 15KV C-L-X for both underground and aerial use, a Southeastern utility company saved more than 20,000 dollars from what it would have cost for a complete underground duct system.

Resists Chemical Attack

Conduit life in this company's calcium chloride reclamation building was only 6 to 9 months. The conduit was replaced with a C-L-X cable system which — after two years of operation, shows no signs of deterioration.

Protects Against Liquids and Gases

An East Coast petroleum tank farm used a C-L-X 8-conductor cable protected with PVC for direct burial in ground that was saturated with oil, gas and water. Result: Perfect performance at a sizeable savings over conduit systems.

Only Simplex C-L-X offers you: Exceptional Strength ... Unequalled Pliability ... Protection from Liquids and Gases ... Faster Installation and Lower Costs. Send for Illustrated Brochure containing Application and Engineering Data.

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INHERENT SPEED, PRECISION AND RUGGEDNESS distinguish the WILD T-1A for land, route, highway and mine surveys... day or underground. Automatic vertical collimation, readings direct to 20 seconds, estimations to 5 seconds, repeating with separate upper and lower motions, and built-in optical plummet make this instrument the preferred standard throughout the world.



WILD HEERBRUGG INSTRUMENTS, INC. • PORT WASHINGTON, NEW YORK In Canada: Wild of Canada Ltd., 157 Maclaren St., Ottawa, Ontario

People in Coal (Continued)

Archibald M. Morrison Jr. has taken over the post of mine superintendent at the Columbia-Geneva Steel Div. coal mines, U. S. Steel Corp., Somerset, Colo. A University of Utah graduate in mining engineering, Mr. Morrison was transferred to Somerset early last year from Columbia-Geneva's Utah mines, near Dragerton.

Association Activities

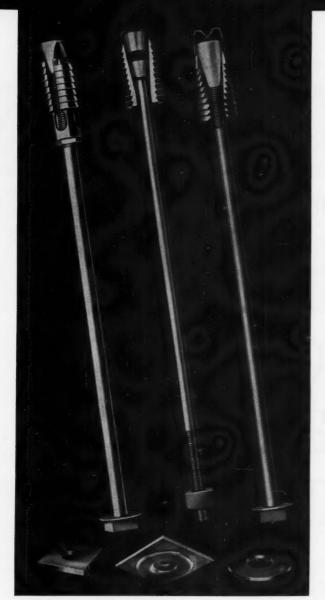
The Washington Coal Club, composed of representatives of coal and related industries and government officials, has elected Carroll F. Hardy, National Coal Association associate director of marketing, president for 1961. Other officers elected were: first vice president, T. Reed Scollon, chief, Div. of Bituminous Coal, U. S. Bureau of Mines; second vice president, George W. Sall, mechanization engineer, American Mining Congress; secretary-treasurer, Robert A. Collinge, editor, Utilization magazine.

Northern West Virginia Coal Association has reelected James F. Trotter of Morgantown, president. Also reelected were George R. Higinbotham, Mountaineer Coal Co.; Stephen Canonico. Clinchfield Coal Co.; and W. J. B. Mayo, Eastern Gas & Fuel Associates; vice presidents, and Truman E. Johnson, secretary-treasurer.

Indiana Coal Association has reelected as president, John W. Scales, Enos Coal Div., Pickands Mather & Co. The representatives of member Hoosier coal companies named as vice president, L. B. Girard, vice president, Peabody Coal Co., and reelected L. E. "Buck" Sawyer, secretary-treasurer and manager. Executive committee members named, in addition to the president and vice president, were: David Ingle Jr., president, Ingle Coal Corp.; W. G. Stockton, vice president-sales, Indiana Div., Walter Bledsoe & Co.; Henry Smith, president, Princeton Mining Co.; Roy E. Dean, vice president, Ayrshire Collieries Corp.; W. J. Crawford, vice president, Enos Coal Mining Co.; and Paul B. Clayton, superintendent, Shasta Coal Co.

Obituaries

Harry A. Treadwell, 75, who retired in 1954 as vice president—operations, Chicago, Wilmington & Franklin Coal Co., after many years with the company, (Continued on p 56)



THREE OF THE MOST WIDELY USED Republic Roof Bolts, left to right, are: square head bolt with RS-1 expansion shell, forged steel wedge head bolt with cast rigid expansion shell, square head bolt with RE-3 bail type expansion shell. Other designs are available to meet particularly unusual requirements.

HOW ROOF BOLTING WORKS

Simplicity, effectiveness, and economy have made mine roof bolting standard operating practice in mines across the country. Holes are drilled (by auger or stoper) into the roof and surrounding walls of excavations. Bolts are inserted and tightened. They are anchored at the top by an expansion device and at the bottom by roof plates or ties.

The layers of stratified rock are fastened together to form a strong roof (much like the added strength thin layers of wood gain when made into plywood) with the tight rock of lower layers supporting strata above.

The strength, safety, and reliability of mine roof bolts has been proved in countless supervised tests, and in thousands of mining installations and underground construction projects.

WHICH REPUBLIC ROOF BOLT IS BEST FOR YOUR MINE CONDITIONS?

In the past fifteen years, as roof bolting really came of age, two important facts became apparent. First, no one bolt is versatile enough to meet all mine roof conditions. Second, in making a selection, a precise knowledge of the effectiveness of various bolt designs when used in different types of strata is needed.

Republic helps you solve both problems. Buy Republic and you choose from the largest selection of roof bolts available anywhere. And field trained Republic Mine Roof Bolt Engineers work with you in selecting or developing a bolt that exactly fills your requirements...the best bolt for your mine.

Completely Automated Production Facilities keep costs down on Republic Roof Bolts. This, combined with quality that is certified (every shipment includes a certificate stating specific physical properties of the steel used), means predictable, top performance at the lowest cost.

For complete information on Republic Mine Roof Bolts and obligation-free Roof Bolt Field Service, send the attached coupon.



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Worlds Widest Range of Standard Steels and Steel Products



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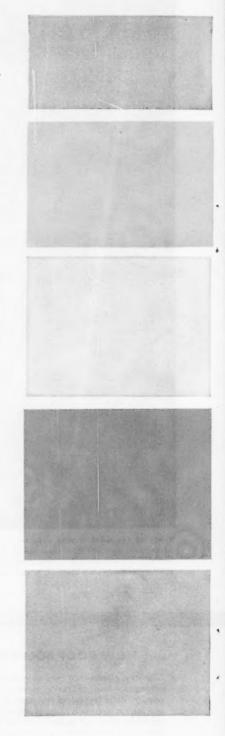
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NO MATTER WHAT YOUR SEAM CONDITION

HAS A CONTINUOUS MINER FOR HIGHEST PRODUCTION

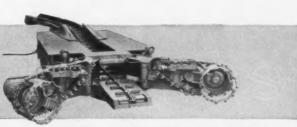
Joy has a continuous miner for every seam condition in high, medium or low seams. Your Joy representative can make impartial recommendations in applying the proper machine to meet the requirements of various seam conditions. For bad roof conditions, integral roof bolting drills may be mounted on most machines and operated while the machine is running.

This complete line is the result of Joy's pioneering and experience with all types of continuous miners. Discuss your problems and seam conditions with your Joy representative. He has the facts and figures to prove that you can get high production regardless of conditions.



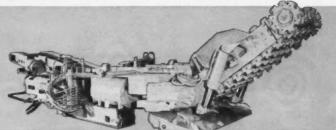
Model CU-42

Joy's newest low seam miner, manufactured at the Compton plant, is available in heights of 30" and 32". Two barrel-type high lump recovery cutter heads swing horizontally from rib lines to center line to mine widths from 14' to 24' in seams from 36" to 54".



Model 5-CM

A field-proved miner 32" in height for high production in medium-low seams. Delivers 4 to 5 tons per minute. High tonnage comes from a 42" wide ripper head that sumps 24" into the coal.

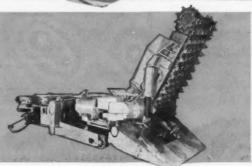


Model 1-CM

Designed for seams 52" and higher, this ripper miner has a capacity of 4 tons a minute. Mounting a 41/2' ripper bar, the 1-CM reaches up to 90" above the floor to rip a 42" wide cut. Can operate in rooms 12 to 19' wide; turn a 14' crosscut 90° from a 14' room.

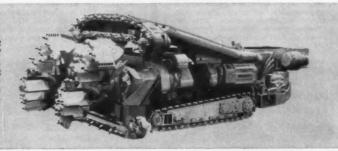


A high-capacity ripper type miner rated at 5 to 5½ tons per minute. Will mine rooms 12 to 22' wide without adjusting or repositioning the machine. Can mine any seam from 5½ to 10' high without changing or adjusting parts. This extreme flexibility makes the 6-CM ideal for all phases of mine development. An independent gathering arm cleanup can load the conveyor while shuttle cars change.



Model 2-BT-2

The Joy Twin Borer, a full-face boring miner for 6 to 8' seams, does any job underground—developing work, driving entries, headings, mining rooms and extracting pillars. The boring arms and top trimmer chain give ex cellent roof control with arched sides and a smooth roof. The top trimmer chain can be adjusted instantly while mining to follow variations in seam height.





WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING MACHINERY



Coal Loaders



0-00 Shuttle Cars



Joy Manufacturing Company Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario



T-WEDGE KLEENSLOT



A new concept in guard bar design. T-shaped wire replaces typical "bar" to increase screening surface while keeping large unscreenable lumps of material above the tolerance governing lower screening surface.

"S" KLEENSLOT



For applications where screening out of flats or slivers is of prime consideration. Also furnished in a "C" bend. Recommended for applications requiring openings larger than 1 m.m.

SCREEN GUARD



Vertical guard bars keep larger unscreenable materials above the actual screening surface. This increases screen life and promotes much greater efficiency in dewatering. F217 and F250 KLEENSLOT



Large size wires maintain maximum efficiency over an extended period in abrasive applications.

Although large in wire size, this screen will maintain openings as close as 1 m.m.

MARCEL



This screen, while screening out "slivers," presents a flat surface for materials to wipe the opening clean Available with openings up to 1 m.m.—for larger opening see "S" screens.

G187 and GB187 MIGH-TEE KLEENSLOT



Special profile increases wearing surface. This is a heavy duty precision type screen that will easily maintain openings smaller than ½ m.m. and openings larger than ordinarily considered economical.



People in Coal (Continued)

died in his sleep the night of Dec. 16-17 in the Cornhusker Hotel, Lincoln, Nebr.

Alfred Jones Walker, a prominent Raleigh County (W. Va.) coal executive, passed away Jan. 6 at the age of 52 after a short illness. He had been general manager of the Slab Fork Coal Co. for 25 yr.

Louis W. Schuler, assistant to the safety director of the United Mine Workers of America since 1952, was killed Jan. 2 in an automobile accident near Frederick, Md. Mr. Schuler had been a mine worker in Pennsylvania before joining the UMWA staff. Mrs. Schuler, daughter of Joseph T. Kennedy, assistant to the president of UMWA, and two sons were injured in the crash and hospitalized.

Completing the Directory

Since the issuance of the Coal Age Operating Guide on "Belt Conveyors and Belting" (December, 1960), information on a number of its products has been received from the Chain Belt Co., Milwaukeee 1, Wis., for inclusion in the directory of conveyors, belting and accessories. They are:

Conveyor Pulleys-Welded generalpurpose, 6 to 36 in; welded heavy-duty (H.D.), 12 to 60 in; slat-wing, 10 to 42 in.

Idlers, Troughing Carrying—Series 1000 (L.D.), 20-deg; Series 2000 (M.D.), 20-, 45-deg and picking; Series 3000 (H.D.), Series 4000 (Extra H.D.), 20-deg, variable and picking.

Idlers, Cushion-Series 3000 (H.D.) and 4000 (E.H.D.), 20-deg.

Idlers, Training—Series 2000 (M.D.), 20- and 45-deg; Series 3000 (H.D.) and 4000 (E.H.D.), 20-deg.

Idlers, Flat Return—All series; cushion, Series 3000 (H.D.) and 4000 (E.H.D.); training, all series except 1000; spiral, Series 3000 (H.D.) and 4000 (E.H.D.), strandard training.

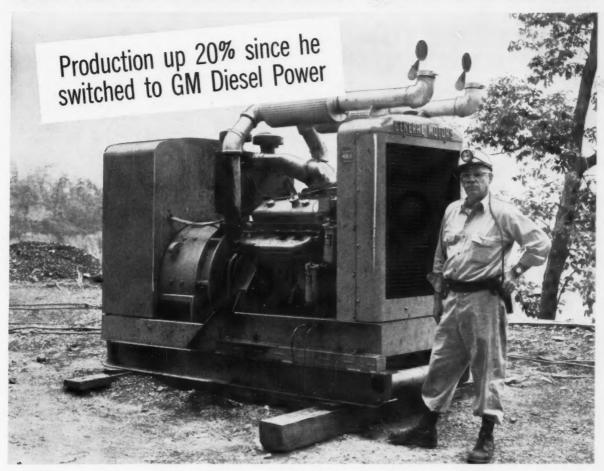
Trippers—Belt-propelled, self-powered, stationary plows.

Takeups—Screw, vertical-gravity, horizontal-gravity.

Backstops-Differential band-brake, ratchet-and-pawl.

Bearings and Pillow Blocks.

GET REAL PRODUCTIVITY-GET A GM DIESEL



Production up 50 tons per day with no increase in fuel consumption.

Equipment slowdown because of sudden load increases ended—electricmotor overloading eliminated downtime and equipment repairs cut...

That's what happened at Phillips Coal Company's Reedy Creek Operation in Pineville, W. Va., when they switched from a competitive Diesel to an 8V-71 "Jimmy."

The "8V-71" runs a 150 KW generator—furnishes all the power needed by a #512 hydraulic coal cutting machine, #14BU Joy loader, two 6SC Joy shuttle cars, belt line, chain line, and 5-foot ventilating fan. There's reserve power for additional equipment if it's needed, too.

Reedy Creek Owner-Manager Leonard Phillips says he picked a GM Diesel because of the job other "Jimmys" have done for him since 1954. He operates a Koehring shovel and two auger drills, powered by "4-71" GM Diesels—reports he's averaging four years between engine overhauls.

If you want to make more money from your mine, put a GM Diesel to

work for you. See your GM Diesel Distributor for details. He's part of a coast-to-coast network of "engine people" you'll find in the Yellow Pages under "Engines, Diesels."



in Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario
Farts and Service Werldwide

GM DIESEL ALL-PURPOSE POWER LINE

sets the standard of Diesel productivity News Roundup (Continued)

Pa. Updating Mining Code

State Mines Secretary Lewis E. Evans said a commission created to update Pennsylvania's 49-yr-old mining code will report to the Legislature this month. Because mining methods and safety concepts have changed sharply since the present code was adopted in 1911, the new code is expected to represent a vast departure from present soft-coal mining practices.

The commission is composed of three bituminous mine company officials, three leaders of the UMW and Secretary Evans.

Mines, Companies

Mining facilities of the Boone County Coal Corp. at Sharples, Logan County, W. Va., have been purchased recently by the newly chartered Utilities Coal Corp. A shutdown of the operation last Nov. 4 idled 240 men. The new owners, however, plan to reopen the mine as soon as necessary preparations can be made.

President of the new corporation is John R. Fields, former official of the Guyan Eagle Coal Co., since bought by Island Creek Coal Co. A. D. (Buster) Scaggs Jr., owner of the Elkay Mining Co., is vice president and general manager of operations for Utilities.

Columbia-Geneva Steel took over full operating control of the Somerset coal mines Jan. 1, it was announced by R. M. von Storch, general superintendent of Coal Mines. Purchased by the Columbia-Geneva Steel Div. of U. S. Steel Corp. in 1955, the mines have been operated under lease by Minerals Development Corp. of Colorado, to supply coking coal to Utah steelmaking operations at Geneva Works.

Colorado Fuel & Iron Corp. has closed its Frederick Mine at Valdez, Colo., for an indefinite period and cut back the work force at the Allen Mine near Stonewall, Colo., resulting in a layoff of 500 miners. Employees at the two mines had been working only two or three days a week since earlier last year when a large number of miners were laid off and the work schedule cut back because of reduced steel production at CF&I's mill at Pueblo, Colo.

Davison Fuel & Dock Co. is the new name of the Raymond City Coal & Transportation Co. This is a change in name only. Personnel, management policies, etc. and address of the general offices (Sunset Ave., North Bend, Ohio) remain the same. The company's two subsidiaries—Fields Creek Coal Co. and Riverton Coal Co.—are engaged in the mining of coal in West Virginia.

Utilization

A chemical charcoal processing plant, to cost \$600,000, is in process of construction by Island Creek Coal Co. at its mine near Red Jacket in Mingo County, W. Va. Completion, expected in May, will reactivate the long idle Red Jacket No. 17 mine which had employed 225 workers. Less than 10 men will be required to operate the entirely automatic charcoal plant.

Finished chemical charcoal will be sold to Union Carbide Chemical Co. which will use the char as a catalyst in numerous chemical operations. An Island Creek spokesman said that heretofore, chemical plants have found it necessary to char their own coal.

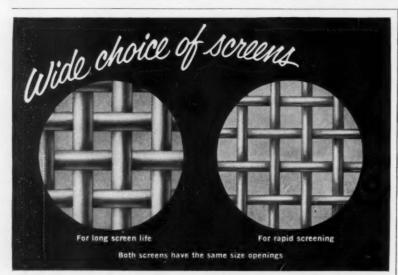
He noted that the product is not to be confused with coke, and added: "We wish to emphasize that this is not to be considered the answer to the problems of the coal industry, but we are very optimistic about it. It has great potential."

The first session of a building custodians' school for local users of solid fuels opened in Norfolk, Va. on Jan. 12, under the sponsorship of local retail coal merchants through the Coal Merchants Service Bureau. Staffed by nationally recognized fuel engineers, the school will enable maintenance and firing personnel to be properly instructed on boilerroom and equipment operations with a view to greater efficiency and economy.

Cooperating in the program are the National Coal Association, the Chesapeake & Ohio Ry., the Norfolk & Western Ry., the Norfolk Redevelopment & Housing Authority, and major coal producers in the Virginia-West Virginia area.

A multimillion dollar replacement and modernization program has been announced by the Donner Hanna Coke Corp. for its metallurgical coke plant in south Buffalo, N. Y. A contract has been let to the Koppers Co. of Pittsburgh for 50 coke ovens of the latest design. Construction is to start March 1 and completion is expected about 10 mo later. Jointly owned by Republic Steel Corp. and Hanna Furnace Co., Donner Hanna, besides manufacturing coke for blast furnaces, is also an important producer of coal chemicals.

The Four Corners mining and power project near Shiprock, N. M., has been officially approved in Washington, D. C. (Continued on p 62)



Different operations make varying demands on vibrating screens: extreme accuracy in sizing . . . reduced clogging of material . . . long screen life . . . or fast screening. There's a CF&I Screen designed to satisfy any of these conditions — you can take your choice of many different wire sizes and screen openings. This means you get exactly the screen you need — giving you more efficient

screening, fewer replacement screens, greater profits.

CF&I Space Screens are made from a

special, long-lasting alloy steel wire, and precision woven to remain tight and rigid throughout their long life. You can choose from a variety of weaves, crimps and edge preparations. For full details about CF&I Space Screens, send for catalog MS 661 Rev.

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"Skooper has the speed and big capacity we need in our loading-out operations. And its flat, crowding action pulls away cleaner coal every time... clay and other material under the seam stays put. We used to use a 1½-yd. shovel. Skooper not only loads out faster but saves us money because of its high production and cleaner delivery of our product."

There's Nothing Like It
On Wheels or Tracks



Ask your Koehring distributor to show you what the Skooper can do to give you better coalloading output. See him soon.



MANAGEMENT HAS A STAKE IN MAINTENANCE

. . . because it can radically affect the tons-per-man rate

Nobody needs to be told—least of all management—that the coal industry is looking for new ways to boost the tons-per-man rate. That's why forward-looking operators are beginning to take a closer look at the maintenance practices in their mines.

Maintenance today is an exact science. And the rewards of treating it as such can pay off in a drop in maintenance costs—often as much as 15 per cent.

The major pay-off, however, is in raised production rates—in other words, in more tons per man-hour.

An efficient maintenance program pays immediate dividends with virtually no capital investment.

The reasons are fairly basic: In the vast majority of mines, maintenance practices have not kept pace with the rapid mechanization of mine operations. And neglect of proper maintenance will inevitably exact a toll in excessive downtime, wasted lubricants and idle men—all factors affecting the cost of producing coal.

Chief electricians and master mechanics are doing their best to combat the problem, but they need management's support—and management realization that the problem exists.

For example: A machine that's overloaded will develop more power, dig more coal. But it will go to

the shop a lot faster, too—overloaded bearings will fail, seals will give way, and the machine is down.

Management men who have investigated this problem, have found that optimum production on a long-term basis can only be achieved by eliminating those practices designed to provide a short-term gain.

This means a planned maintenance program operating on a year-round basis.

TEXACO CAN HELP YOU SET UP A PLANNED MAINTENANCE PROGRAM

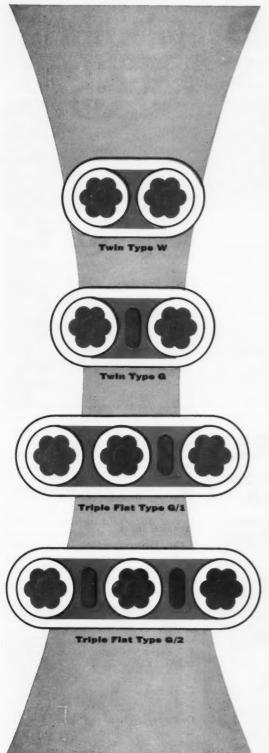
Lubricants are important in keeping equipment operating efficiently. Not only the choice of the lubricant itself, but also its storage, handling and application can affect equipment life. For this reason Texaco has made an exhaustive study of mine maintenance problems. We would be glad to help you set up a planned maintenance program or discuss any phase of it with you. Just call the nearest of the more than 2300 Texaco Distributing Plants or write to Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV



LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)



OKOCORD RED SADDLE FLAT TYPE CABLES

For SHUTTLE CARS
and MINING MACHINES
...a-c or d-c

designed to resist constant flexing, pulling, twisting and accidental damage between conductors.

Get longer cable life and cut downtime on shuttle cars and mining machinery by specifying Okocord Red Saddle flat type cable for *your* equipment. This special construction has proved its reliability through years of rugged service in mines across the country.

The insulated conductors are separated by a red preformed Okoprene filler—Red Saddle. This flame-resistant, protective wall acts as a cushion between the conductors, providing extra security against short-circuiting during crushing or run-overs. Red Saddle provides an additional safety feature by preventing the propagation of flame in case of short-circuiting of the conductors.

The entire assembly of this streamlined portable cable is covered with a strong, nylon open braid reinforcing, locking it tightly together. This construction adds additional strength against excessive pulling or twisting. The overall jacket is Okoprene . . . a tough abrasion resistant, yet highly flexible neoprene compound. It offers maximum resistance to flame, oils, acids, alkalies and water. Of course, all Red Saddle Okocords meet the Bureau of Mines flame-resistance test.

Send for a sample of any of the constructions shown here, and get full details about Okocord Red Saddle Cables. Write: The Okonite Company, Passaic, N. J.

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where there's electrical power . . . there's OKONITE CABLE

News Roundup (Continued)

Included in the approval were Utah Construction & Mining Co.'s Plan of Development and Operation of the 24,000 acres of coal-bearing lands which it holds under lease from the Navajo Tribe, the Plant Site Lease and Power Supply Agreement between the Navajos and Arizona Public Service Co. Arizona PS can now proceed with construction of its power plants which initially are for a generating capacity of 350,000 kw, representing a capital investment of over \$100 million. Fuel for the new plant, which will consume 4,200 tons of coal each 24 hr, is to be supplied by the Utah company under long-term contract with Arizona PS.

A contract for two 80,000-kw steampower turbo-generators, to cost \$30.4 million, has been awarded to General Electric Co. by the Tennessee Valley Authority. Each of the units will require a boiler that will burn more than two million tons of coal annually. To be the largest power generating units ever manufactured, according to TVA, the new units will be able to carry loads considerably in excess of their rated capacity and are designed for future automation. Though their location was not revealed. speculation by the Nashville Tennessean newspaper places them near Oak Ridge,

New Books

History of West Virginia Coal

History of the West Virginia Coal Industry, by Phil Conley provides an interesting story of the development of the coal industry. In tracing the history of the West Virginia coal industry, the author covers mining laws, mining methods, transportation, markets and life in a mining town. Each coal field receives individual treatment, beginning with the first shipments and ending with its position today, 311 pp. 6x9-in; cloth. \$3.95, Education Foundation, Inc., Box 1187, Charleston, W. Va.

Pennsylvania Dutch Miners

Black Rock, by George Korson unfolds the history and folklore of the Pennsylvania Dutch in the anthracite mining region. Beginning with Philip Ginder, discoverer of anthracite, the author brings to life the legends, lore, dialect and music of these people. Written in a highly readable style, the book holds the reader's attention while unfolding the many facets of the lives of the Dutch miners. 453 pp. 6x9-in; cloth. \$7.50, The John Hopkins Press, Baltimore 18, Md.

Energy Study

Energy in the American Economy

1850-1975, by S. H. Schurr and B. C. Netschert with V. F. Eliasburg, Joseph Lerner and Hans Landsberg. This work is a comprehensive economic study of the history of energy in our economy and the tremendous growth it will have between now and 1975. Part I deals with the record of the major energy sources from 1850 through 1955 and some aspects of energy consumption in relation to economic growth. Part II studies the future of energy consumption and Part III analyzes the future energy supply. The authors estimate that bituminous coal consumed by electric utilities in 1975 will be about 754 million tons. In addition to covering the energy subject in the text, the authors include more than 250 pages of tables and appendices. 774 pp. 61/2x10-in; cloth. \$12.50, The Johns Hopkins Press, Homewood, Baltinore 18, Md.

Safety Directory

Best's Safety Maintenance Directory is combined in one volume with the new Manual of Modern Safety Techniques. It describes and illustrates the various devices and products approved for accident prevention, fire control, maintenance and hygene in American industry. The portion of the volume covering modern safety techniques provides reference material on how to set up a safety program, how to get group participation, resuscitation, fire codes, machine tool hazards and how accidents drain away profits. The book gives the safety man an accidentprevention manual and a buying guide in one handy volume. \$7.50, Alfred M. Best Co., Inc., 75 Fulton St., New York 38, N.Y.

Technical Index

The Engineering Index, edited by Carolyn M. Flanagan contains over 39,100 annotations of articles reviewed in some 1,700 publications of engineering, scientific and technical societies; engineering and industrial periodicals and government publications; engineering experiment stations, universities and research organizations. 1,532 pp. 7x1-in. \$70, Engineering Index, Inc., 29 W. 39th St., New York 18, N. Y.

Coal Preparation

Third International Coal Preparation Conference, written in English, contains the final versions of the papers and discussions, list of members, general reports etc. of the conference. It deals with the present state and problems of coal preparation in the world and provides preparation engineers with a valuable reference work on all types of preparation techniques. 789 pp. 81/2x11-in; paper. 600 BF, Institut National de l'Industrie Charbonniere, Liege, Belgium, 7, Boulevard Frere-Orban.

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants NOW IN AEROSOL SPRAY-ON CANS!



HANDI-LUBE LIQUID GEAR COMPOSITION

For open gears, sliding surfaces—exclusive formulas eliminate metal to metal contact, keep wear on the lubricant not the metal -no breakdown even after prolonged use under water -available for every climatic condition-packaged in handy 16-oz. aerosol spray-on containers or in bulk containers-send for a free trial sample.



WIRE ROPE SPRAY LUBRICANT

Exclusive formulas for lubricating and protecting wire rope, chain, springs. Penetrates to the core of wire rope minimizing internal friction and increasing usable life up to 300%—special protective qualities absolutely eliminate corrosion—non-gumming qualities reduce "carry-back"—packaged in handy 16 oz. aerosol spray-on containers or in bulk con-tainers—send for a free trial sample.

65 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING: Open Gears, Dipper Sticks, Cams

Open Gears, Dipper Sticks, Cams
 Hydraulic Units, Torque Converters
 Roller, Ball, and Sleeve Bearings
 Speed Reducers

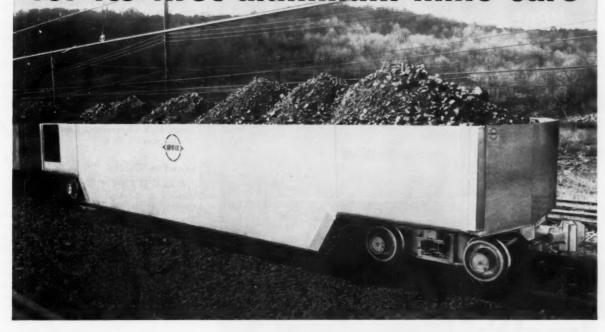


Est. 1893

THE WHITMORE MANUFACTURING CO. LUBRICATING ENGINEERS

CLEVELAND 4, OHIO, U.S.A. PHONE: VULCAN 3-7272

Irwin chooses Timken® bearings for its first aluminum mine cars



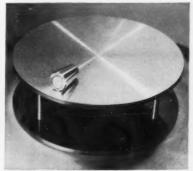
result: more cars per trip-more trips per car

Now Irwin-Sensenich Corporation offers its first aluminum mine cars and they're all on Timken® tapered roller bearings. With these light-weight, yet strong aluminum cars, coal operators can haul more cars per trip, save on power and labor. And because the wheels are on Timken bearings, miners can count on making more trips per car with less maintenance.

With Timken bearings you can be sure of reliable performance. One reason is their uniform high quality. Another is their tapered design that takes both radial and thrust loads. And full-line contact between rollers and races gives extra load-carrying capacity. Because Timken bearings have low internal stresses and true rolling motion, they practically eliminate friction. Cars start and roll easier, save power. And because natural pumping action moves lubricant through the bearings, with no outer race grooves to trap dirt, maintenance is reduced. Timken bearings roll trouble-free, longer.



ON THE SPOT—that's how bearing problems are often solved by Timken graduate sales engineers. They'll work with you at the design stage, help you select the most economical bearing for your requirements.



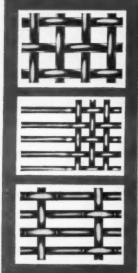
ROLLS FOREVER in the same circle. This oscillating table demonstrates the accuracy of the taper of a Timken bearing roller. And precision manufacture assures true rolling motion.



The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ontario.



tough, hard and ductile alloyed wire—tightly, rigidly woven with extreme accuracy into screens unequalled for resistance to abrasion, distortion and fatigue. Precision-formed hook strips, applied over wire edges sheared absolutely square, insure easier installation under maximum tension to prevent excessive wear and breakage. Flat, buckle-free L-S Screens inrecase speed of feed, reduce recirculating loads, boost output, improve product quality. Get more for your money—be sure the screens you buy are Ludlow-Saylor.



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Ludlow-Saylor Screens and Wire Cloth can be furnished in any steel including SUPER-LOY high carbon, LUDLOY oil-tempered, stainless or other alloys. Monel, bronze, copper, brass and most other metals that can be drawn into wire.

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Opening Design

Design of Underground Openings in Competent Rock, by Leonard Obert, W. I. Duvall and R. H. Merrill presents methods and principles useful in designing underground openings and pillars in competent rock. The authors deal with two types of formations: massive, in which openings are generally mined with an arched roof; and bedded formations, in which openings are generally mined with a flat roof. Also included are experimental procedures for making stress, strain and in situ physical-property measurements in mines to check design calculations. Bulletin 587, Bureau of Mines. 30¢, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Mine-Fire Control

Control of Fires in Inactive Coal Formations in the United States, by F. E. Griffith, M. O. Magnuson and G. J. R. Toothman describes the activities of the Bureau of Mines in controlling fires in inactive coal formations. The authors describe and evaluate fire-control methods used in 70 fire-control projects. Bulletin 590, Bureau of Mines, 8x10½-in paper. 60¢, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Ash Fusibility

Fusibility of Ash of United States Coals, by R. F. Abernethy and E. M. Cochrane includes all information on fusibility of ash of coal tested from 1921 to 1957. The data provide useful information to the customer because the tipple samples represent the coal as used. Information Circular 7923, Bureau of Mines, \$1.75, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

New Electrical Code

National Electrical Code Handbook, tenth edition, is thoroughly revised to include the many changes made in the code. Stressing the need for better electrical installations to minimize hazards to persons and property, the handbook tells how to handle all types of wiring and installation jobs and gives detailed coverage of individual provisions of the code. Since the numbering system of the code has been changed for the first time in 20 yr, the new edition antiquates previous editions. A convenient table shows both old and new numbering systems. \$8.50, McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y.

The following publications may be obtained from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.:

American Standard Practice for Rock-

dusting Underground Bituminous-Coal and Lignite Mines to Prevent Coal-Dust Explosions. I. C. 8001.

Hydrogenating Coal in a Pilot Plant with a Molybdenum Catalyst. R. I. 5673.

Producing Heavy Fuel Oil by Hydrogenating Bituminous Coal. R. I. 5674.

Extracting Final Stump in Pillars and Pillar Lifts with Continuous Miners. R. I. 5631.

Controlling Mine Fires with High-Expansion Foam, R. I. 5632.

Hazards of Cutoff Explosive Charges in Multiple Blasting of Coal. R. I. 5613. Survey of Face Ventilation Practices in

Survey of Face Ventilation Practices in Coal Mines. R. I. 5560.

Frictional Ignition of Gas During a Roof Fall. R. I. 5548.

Petroleum Coke for Blending

Petroleum Coke in Illinois Coal Blends for Blast Furnace Coke, by H. W. Jackman, R. L. Eissler and R. J. Helfinstine. As a result of studies made in a pilot oven, the authors conclude that cokes with properties suitable for blast furnace fuel can be made from blends of Illinois coal and petroleum coke. But they point out that pilot-oven data are not conclusive evidence of coke performance and such blends should be tested on a larger scale. Circular 305, 10 pp. 63/4x10-in; paper. Division of the Illinois State Geological Survey, Urbana, 1ll.

Examination Questions

Professional Engineer's Examination Questions and Answers, by W. S. La-Londe Jr. Planned to keep pace with the rapidly developing new engineering ideas and procedures in recent professional engineer's license examinations, this widely used question-and-answer guide is now available in a revised and enlarged second edition. Over 600 questions selected from recent actual examinations for the professional engineer license, land surveyor license and the engineer-in-training certificate are included. The questions cover all major areas of professional engineering examinations. Many are composites of the more complex questions found in professional engineering examinations all over the United States. 615 pp. 51/2x8-in; cloth. \$7.50, McGraw-Hill Book Co., 327 W. 41st St., New York 36, N. Y.

Electrical Design

Electrical Design Details, by J. F. Mc-Partland and W. J. Novak provides an up-to-date file of wiring diagrams, schematics and detail drawings. It gives many examples from actual installations to illustrate such features as wiring, circuit layouts, equipment installations and construction details. Each diagram is accompanied by explanatory material. 200 pp. \$8.50, McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y.



When results are compared, Austin Apcomite proves to be more economical to use than on-the-job ammonium nitrate mixes. Besides producing greater explosive power per foot of loaded blast hole, it combines the low initial cost features of processed ammonium nitrates with the handling ease and controlled shooting of regular explosives.

Field tested for 3 years, Apcomite is ready for loading in vertical or horizontal holes—ready to shoot. Each tube has a primer in its nose . . . requires no special priming. Because it is always manufactured under the same uniform conditions, Apcomite can be used for controlled shooting not possible with on-the-job ammonium pitrate mixes.

2 TYPES MEET ALL CONDITIONS

Apcomite 17 and Apcomite 20A incorporate specially-processed ammonium nitrate packaged in 23G tubes of 5" and larger diameters. While they are basically the same, No. 17 is for all normal usage while No. 20A, with its greater density, is for wet holes.

Austin also produces Austinite 15, a controlled ammonium nitrate mixture furnished in polyethylene-lined burlap bags. Likewise available in bulk bags of 50, 80 and 100 lbs.

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- convenience . . . eliminates most shipping, storage, mixing and materials handling problems
- no special priming needed . . . primer in nose
- packaged in 23G tubes that are easy to handle and load
 uniformly manufactured . . . no chance of improper mixing
- permits controlled shooting
- adaptable to vertical or horizontal holes

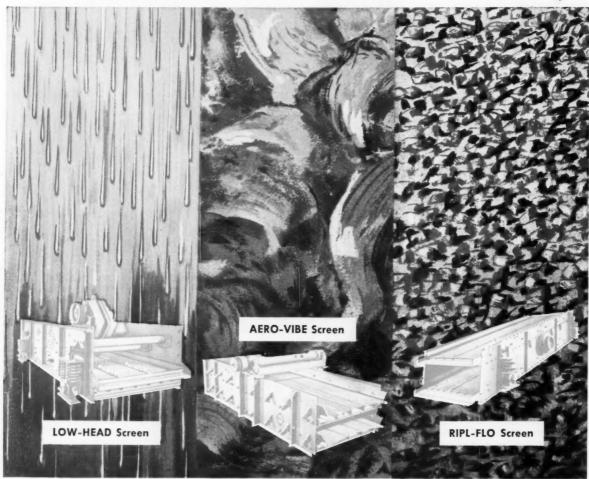
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Air Pollution

Proceedings of the International Clean Air Conference contains 78 papers from 17 countries that were presented at the London conference in 1959. Among the wide range of subjects discussed are national air pollution problems, legislation, education, dust collection, sulphur in the air and research. 283 pp. 7x10-in; cloth. \$4.75, National Society for Clean Air, Field House, Breams Building, London, E. C. 4, England.

Equipment **Approvals**

National Mine Service Co.-Type D-12678 battery-powered utility truck; one motor, 15-hp, 60-V, DC. Approval 2F-1599, Dec. 1.

J. H. Fletcher & Co.-Type DMB2-13-C4-R3 boom-style roof drill; one motor, 25-hp, 440-V, AC. Approval 2F-1600A, Dec. 6.

Jeffrey Mfg. Co.-Type MT-101 shuttle car; three motors, each 10-hp, 250-V, DC. Approval 2F-1601, Dec. 7. Columbus-McKinnon Corp. — Type RF-44 ratio feeder conveyor; one motor, 71/2-hp, 240-V, DC. Approval 2F-1602, Dec. 7.

Delmont Fuel Co.-Type 8BU-13E rebuilt Joy loading machine; one motor, 25-hp, 550-V, AC. Approval 2-F1603A, Dec. 9.

Lee Norse Co.-Model CM38Y-1E continuous miner; three motors, each 75-hp, 440-V, AC. Approval 2F-1604A, Dec. 13.

Joy Mfg. Co.-Type 18SC6BPH/-BPXH-I shuttle car; four motors, three 25-hp, and one 15-hp, 440-V, AC. Approval 2F-1605A, Dec. 14.

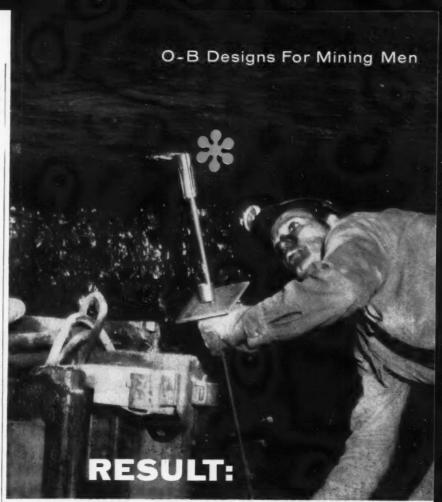
Jeffrey Mfg. Co.-Type MM-100L continuous miner with 94-L conveyor; three motors, one 70-hp, and two 3-hp, 250-V, DC. Approval 2F-1606, Dec. 21.

Goodman Mfg. Co.-Type 429 borer; three motors, two 250-hp, and one 50-hp, 250-V, DC. Approval 2F-1607, Dec. 27.

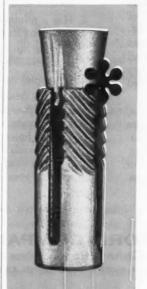
The following fire-resistant hydraulic fluids were approved by the USBM under Schedule 30:

Texaco Inc.-Texaco TL-4625. Approval 30-9, Dec. 28.

Humble Oil & Refining Co.-WS-4292 and WS-4254 Concentrate. Approval 30-10, Jan. 5.



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Devoted to the Operating, Technical and Business Problems of The Coal-Mining Industry



FEBRUARY, 1961

IVAN A. GIVEN, EDITOR

The Shape of the Future

To those in the business, the perils and pitfalls of forecasting are well and sometimes painfully known. But the game is still worth the candle, since to do any kind of an intelligent job of planning and conducting operations some kind of an estimate of what may be ahead is a real necessity.

There is a thing or two on the side of the man trying to look into the future. The record a few years ahead is influenced to a significant extent by the actions taken today. And in addition, the forecaster—at least in coal—can assume, on the records of the industry and those that serve it, that there will be a constant succession of new developments in all areas designed to benefit the industry and the individual organizations in it.

A look at the record supports the point. Though depression has distorted the picture there is no question but that bituminous coal's competitive power is greater and more effective than it was five years ago, even though one can agree that it still is not what it should be. What happened in these five years? On the production side, continuous mining really got rolling, "super excavators" and ammonium-nitrate blasting gave stripping a big lift, the percentage of coal mechanically cleaned moved up to two-thirds of the total, and the industry overhauled its merchandising and general organizational setups. An increase in tons per man from 9.84 in 1955 to over 13.0 in 1960 is one evidence of the results.

What can happen in the next five years? Commercial development of R-C (remotely controlled) mining, still bigger stripping and haulage units, further expansion of the concept of "laborless" preparation, and corresponding advances in other mining, preparation, safety and supporting activities, should push bituminous tons per man to 17.0 plus.

Thus we come to the final question: What can bituminous look forward to in the line of annual output? If the tonnage increase should average 3% each year over the preceding year, which is about what the utility industry alone should provide, production in 1965 should be 480 to 490 million or more. Counting in gains in steel and elsewhere and subtracting such losses as might be conceived, it is reasonable to expect that 525 million or more will be more like it. The surety that coal can increase its competitive power and attain this or a larger total is in, as noted, the steps that are being taken now and in the immediate future. They are potent ones,

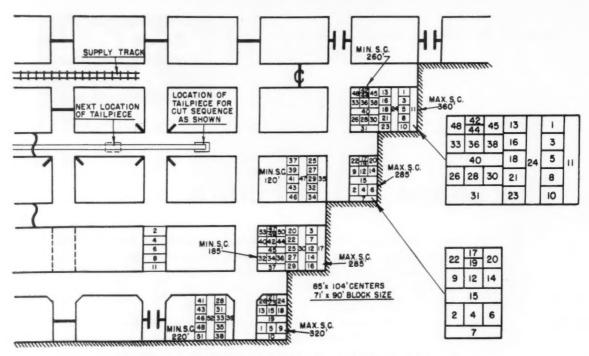


FIG. 1-EXTRACTION plan for removing four blocks of coal.

Yielding Jacks Aid Pillar Pulling

Plans for pillar recovery in the Pittsburgh seam include the use of yielding hydraulic jacks in lieu of cribs. The big advantage is greater safety for the men who recover and set the open-end supports.

Wayne D. Snell, Chief Mine Inspector of the various types of machines that Frick District United States Steel Corp. Uniontown, Pa.

A COAL MINER who has been initiated to the limitations of continuous mining machines knows that every phase of the mining operation adversely affects the continuity.

In leading up to the Frick District method of handling the particular phase of mining that obstructs to the greatest extent the desired continuity -that is, the support and control of the mine roof-I should like to mention briefly our solutions for the other phases of mining and the peculiarities have a detrimental effect on the uninterrupted flow of coal.

The standard method followed in the mines of the Frick District in extracting virgin coal areas with continuous mining machines is to drive four or five entries on 85-ft centers and to drive crosscuts on 103- or 104-ft centers. Driving these rooms and crosscuts 14 ft wide with rippertype continuous miners leaves pillar blocks of coal measuring 71x90 ft for recovery on retreat. The 12-ft entry driven by a boring-type continuous miner leaves pillar blocks correspondingly larger. Five entries are driven to start a section. The entry next to the virgin coal area serves as a bleeder heading as the pillars between the other entries are extracted. Four en-

tries are then driven for succeeding panels, and the pillars of the former bleeder entries are extracted in step with the rib lines, again leaving the entry next to the virgin coal area in each panel to serve as a bleeder heading.

The two-split system of ventilation is utilized with the air coursed down the center headings to the face where it is split to return through the two outer entries. Fire doors are provided so that the air may be reversed to provide an emergency escapeway through fresh air in one of the former return air courses in case fire or some other difficulty is experienced in the former intake air courses.

Frick District mines have depended on line canvas to direct a flow of air over continuous miners. At the present

From 1960 meeting of Coal Mining Institute of America, Pittsburgh, Pa.

time, however, experiments are being conducted with auxiliary fans to provide ventilation over the machines.

Returning to the use of line brattice, we have found it expedient, because of dust control problems, to direct the intake air in front of the line canvas, over the ripper-type continuous miners, and return it behind the line canvas. Our practice with the boring-type continuous miner is the opposite: The intake air is directed behind the line canvas and is returned over the machine.

High-pressure water sprays are provided on the machines to aid in allaying dust at its source. Rock dust is applied on and between shifts to conform with state and federal requirements.

Maintenance and repair of mining machines is a complex subject in itself, and I shall dispose of it by stating that it is our practice to provide an extra continuous miner on each section so that one machine may be idle each shift for maintenance. In addition the extra machine serves as a spare in case mechanical difficulty is experienced with one of the machines during its scheduled operating shift.

All of these phases of mining and maintenance slow down and quite often interrupt the mining operation,

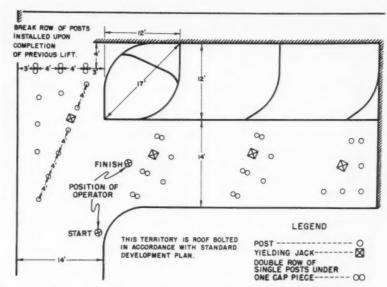


FIG. 2-HOW roof is supported as a ripper-type miner removes a stump.

but not as much as mine roof control.

Shuttle cars are used to transport the coal from the miners to loading ramps where the coal is discharged either onto extensible belts, or into mine cars that are moved forward as loaded by remotely-controlled car hoists. In the use of extensible belts, they in turn discharge their coal into mine cars moved by remote control.

The distance the shuttle car must haul the coal to the dumping point has an important effect on the operating time of the mining machine, but the use of a second shuttle car enables one car to be traveling to and from the dumping point while the other car is being loaded, and this greatly re-

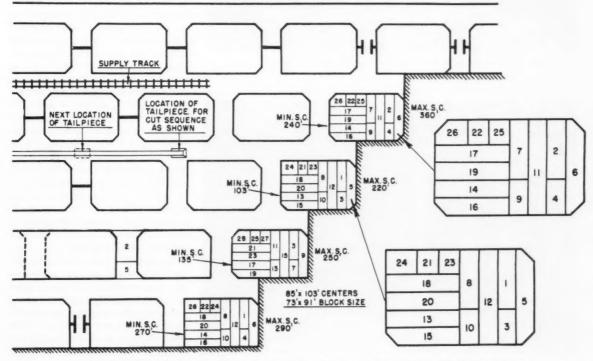


FIG. 3-THREE boring-type miners, two working and one standby, take four blocks this way.

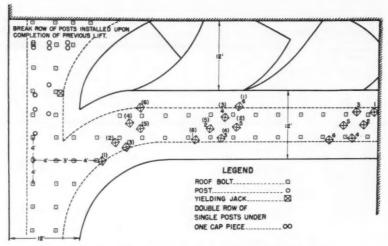


FIG. 4-THIS roof-control plan is used with boring-type machines.



FIG. 5-HOW hydraulic jacks and breaker posts flank a pushout stump.



FIG. 6-CLOSEUP of roof supports with cave immediately inby.

duces the downtime of the machine.

This is the method that generally has been accepted and used, although our district has experimented with using a shuttle car as a surge bin, and with the method of having the continuous miner discharge the coal it mines onto the floor in back of it, then using a conventional loading nuc chine to load the coal into shuttle cars. This latter method is regarded with adverse feelings because of the fact that it tends to bottle up the continuous miner should roof conditions become such that quick withdrawal of the miner is required. The accumulation of coal also impedes the flow of air.

This brings us to the phase of mining that is most detrimental to the continuous mining of coal—the necessity of providing a replacement for the support of the overlying strata, or mine roof, that originally was provided by the coal that is extracted.

I do not think anyone will disagree that the advent of roof bolting, more than anything else, made possible the continuous mining of coal as we know it. But then again, complete dependence cannot be placed on roof bolts to support the roof, as experience has shown that other devices are needed to give warning when the roof begins to take weight, and to aid the bolts in supporting wide expanses of roof.

Each of the various types of continuous miners in itself causes limitations which must be dealt with in a different manner. It is a requirement of state and federal roof bolting permits that the operator of a loading machine or continuous miner not be permitted to go beyond the last permanent roof support in the process of loading or mining coal. But like most rules, there is an exception, and that is in regard to the operation of the boring-type continuous miner, which leaves a natural supporting arch in the roof coal on each side of the entry. With this machine, because of the support offered by the roof coal arches, the operator is permitted to operate the controls to a point 35 ft inby the last roof support.

In any event, there is a definite limitation to which any type continuous miner may advance the face before its progress must be stopped to permit the roof bolters to catch up with the support of the roof—unless, and here again there is an exception, the roof bolts are installed simultaneously with the advance of the mining machine.

The extraction sequence of one of our ripper-type machines permits the forward motion of the machine to be stopped, after the cutting bits have been sumped 18 to 20 in into the coal, while an upward sweep of the cutting bits is made. During this interval, hydraulic roof jacks mounted at the front of the main body of the machine are raised against the roof to provide temporary roof support for a roof bolter working on each side of the machine, and ahead of the operator, to drill holes in the roof and install roof bolts.

Originally, rotary-type drills were mounted on the machines to accomplish this drilling, but inasmuch as a satisfactory means of collecting the dust could not be devised for this type of drill, and because their slowness in cutting through sandstone caused delays to the machine, our company has abandoned their use in favor of the percussion-type drill, which, incidentally, is not mounted on the machine.

Mining the Pittsburgh seam with an extraction height of 6 ft or better, the open-end system of mining had been our basic system from the days of hand loading through the days of trackless mining with conventional mining equipment. The limit of an 8-ft advance to each cut loaded out, as imposed by the length of the bar on the cutting machines, necessitated the extraction of a wide expanse of coal on each cut, and the allowable 25-ft width of an open-end place lent itself to providing the most efficient method of coal extraction.

The double or more length of advance permitted by the continuous miners changed this outlook as the narrower, or 12- to 14-ft entry, lends itself to better control of the roof. Accordingly, the pocket-and-wing system of mining, originally used in pick mining days, was reverted to as the system of mining best adaptable to the peculiarities of the continuous miner.

These operating peculiarities of the continuous miners necessitate the issuance of three different sequence plans for the extraction of pillars. They are (1) plan for extraction of pillars with ripper-type machines, roof bolts installed simultaneously, (2) plan for extraction of pillars with ripper-type machines, (3) plan for extraction of pillars with boring-type machines.

The first system has limited usage at present in our company because of difficulties frequently encountered in

working the roof bolters alongside an operating machine, expecially where the condition of the roof is such that planks and header blocks must be be used in conjunction with the roof bolts. For that reason, I shall not go into detail in regard to this mining procedure, other than to state that two face lifts and one butt lift are extracted from the original 71x90-ft block of coal before the miner is moved to the next block of coal down the pillar line. This serves to keep the block of coal as near to a square as possible. On the next trip down the pillar line, the continuous miner then extracts a butt lift, a face lift, then the pushout intersection stump to complete the extraction of the pillar block. In this manner the rib line is kept in step with a minimum amount of tramming of the machine from place to place.

The limitation of a 16-ft advance of a ripper-type continuous miner when roof bolts are installed as a separate operation creates a problem of tramming the machine from place to place to keep it operating while the roof bolts are being installed. The enlargement in Fig. 1 of two adjoining pillars of a 4-pillar block panel shows the cutting sequence that has been devised to keep the required tramming distance to a minimum.

Starting with cut 1 in the top block, which starts the pocket of a face lift, the machine is moved to cut 2 in the lower block to start the pocket of a butt lift. The machine alternates between the pockets and extracts the wing as cut 7 in the lower block. Cuts 10 and 11 finish the pocket and wing in the upper block. In the meantime cut 9 was made to start a new butt pocket in the lower block, and this pocket is continued with cut 12 after cut 11 completed the pocket and wing in the block above. The cutting sequence shown on the drawing is followed through until the lower block is completed and extraction of the inby half of the next outby pillar is completed.

Although not enlarged on the drawing, a separate cutting sequence is shown for a second machine in the section to extract the lowest two pillar blocks. You will notice that the driving of crosscuts to establish connections with the bleeder heading of the preceding panel is included in the extraction sequence so that the pillars along the former bleeder heading may be extracted.

Before leaving this system of ex-

traction, I should point out that the ripper-type machine must be trammed into a place five times to extract a face lift pocket and wing.

Now we shall study how the roof is supported (Fig. 2) while extracting a pocket and wing with the ripper-type continuous miner. Before the pocket is started, break row posts, single posts, and the hydraulic yielding jack, indicated by an "X" in a square, are installed in the straight entry. Originally, a crib was used in the intersection, but a jack is now used in its place. The pocket is driven 14 ft wide, then 12-ft wings to the left, or 10-ft wings to the right, are extracted by means of successive lifts on retreat. Roof bolts are installed on 4-ft centers as the pocket is advanced. Upon completing the pocket, a yielding jack and posts are installed as shown before the first wing lift is extracted. Upon extracting the first wing lift, the posts for the next wing lift are installed, then the hydraulic jack is recovered and reset. This procedure is repeated until the extraction of the wing is completed. I should point out that the wooden posts in these installations are not recovered or dislodged.

In case you have a question along that line, roof bolts on 4-ft centers with bearing plates are minimum requirements in a pocket. If roof conditions require it, header blocks or sawed planks with supporting legs are installed in conjunction with each, or every other, row of roof bolts, the supporting legs serving as visual and audible warning devices of an impending roof failure.

As stated previously, the boringtype continuous miner leaves an arch in the roof coal on each side of the entry, providing a natural means of support for the roof—in addition to the minimum of 8 in of roof coal that is left in the center. For that reason, an operator of a boring-type machine is permitted to operate the machine 35 ft in advance of the last roof bolts, and since the controls are 15 ft from the face, an overall advance of the face up to 50 ft from the last roof bolts is permitted.

This brings about greater flexibility to the cutting sequence plan (Fig. 3) for the extraction of pillars with boring-type machines, as compared with the plan for the ripper-type machines where bolts are installed separately. Here again two adjoining blocks of a 4-pillar rib line cut sequence plan have been enlarged to show the re-

quired movements of the machines.

Cut 1 in the lower block starts a pocket on face course, and after extracting cut 2 in the upper block, a second cut, or cut 3, finishes the pocket in the lower block. The machine returns to the upper block to extract cut 4 while roof bolters are installing bolts in cut 3 area, then the machine returns and extracts the wing as cut 5 in the sequence. An additional pocket and wing on the face course is extracted from each pillar block, then the machine alternates between two pocket and wings on the butt course from the blocks in cuts 13 through 20. A face lift and the intersection stump completes each pillar block in cuts 21 through 26.

Here again the lower blocks show the cutting sequence for another machine to extract the pillar blocks along with driving crosscuts through the solid pillar of coal to make connections with the entry formerly used as a bleeder heading. You will note that the pillars of the upper entry are left intact so that the upper entry will serve as a bleeder heading for the extraction of this panel.

As previously mentioned, five tramming trips were required with the ripper-type miner to extract a face lift pocket and wing; whereas, three trips are required with the boring-type miner.

Experiments with the yielding-type hydraulic jack began in the Frick District aproximately 3 yr ago and their original use in lieu of cribs has been gradually expanded until they now are used in place of posts in the extraction of wing lifts with the boring-type machine.

The pocket-and-wing extraction plan (Fig. 4) for the boring-type miner indicates that the usual break row posts and single posts are set at the mouth of the next pocket prior to recovering the yielding jack from the preceding pocket-and-wing intersection and resetting the jack in the position shown. Rows of two roof bolts on 4-ft centers are installed as shown to the end of the pocket. Six yielding jacks are then installed as shown before the first wing lift is extracted.

Upon completing the wing lift, the most inby jack, indicated by the numeral "1", is pulled and set as the most outby jack for the next wing lift, again indicated by the numeral "1", and this procedure is repeated until all six jacks have been pulled



FIG. 7-PULLING the ropes releases and recovers the jacks.

and reset. The procedure is the same for each succeeding wing lift until the push-out stump is reached. Upon extracting the push-out stump, the break row and signal posts are installed for the next pocket and wing, then the yielding jacks are released and recovered to complete the making of the

Fig. 5 is a picture of a push-out wing stump, showing the position in which the hydraulic vielding jack and break row posts were installed in the straight entry before the pocket was turned. To the right can be seen several of the six yielding jacks installed in two diagonal rows to support the roof of the pocket.

Fig. 6 is a closer view of the roof supports in the intersection or straight entry. Note the position of the hydraulic jack and the fallen gob material immediately beyond the break row posts.

The view of the hydraulic jacks in the pocket in Fig. 7, taken in the direction of the last wing lift, shows more clearly the staggered position in which the two rows of jacks are installed. Also, you can see how the jacks caused the strata to break off immediately inby them as the fall oc-

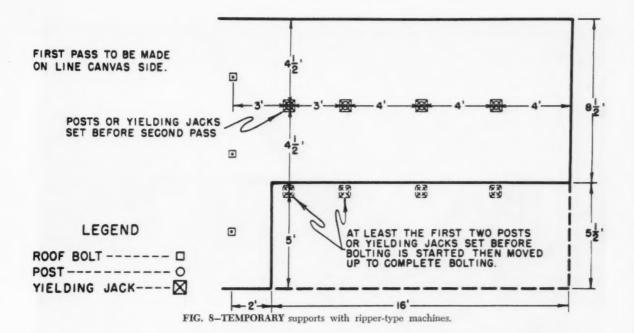
Without doubt the question has arisen in your minds why we are using hydraulic yielding jacks instead of cribs, and in some instances instead of

It has been our practice, throughout my experience with the Frick District, to pull main roof supports so as to promote the free-breaking of roof strata and retard the projection of weight on pillars in advance of the fracture line. The cost of the crib blocks and, of course, the hydraulic jacks, has made it imperative that both be recovered.

Time studies indicate that the combined time of two men, plus a shuttle car operator, adds up to 24.17 min to extract a crib; whereas, the combined time of two men to extract a hydraulic jack is 1.25 min. It was computed that the two men were exposed to the possibility of a roof fall a total combined time of 12.5 min to attach the rope to pull the crib to recover the crib blocks. In addition to this, 25% of the crib blocks generally are not recovered.

In comparison, the men extracting the hydraulic jack have no exposure time to a possible fall of roof as the pull rope is placed in position when the jack is installed, and they stand back out of the fall area and simply pull on the rope to release the hydraulic pressure and to drag the jack out of the fall area.

I do not believe that the results of time studies are needed to indicate to anyone that it is quicker and easier to install the hydraulic jack than it is to erect a crib, considering the fact that the former only requires the



placing of a header or crib block over the jack, in some instances a crib block under the jack, and several pumping strokes of a handle to build up hydraulic pressure.

The jacks used for the purposes previously stated extend to 84 in, weigh 136 lb, and will support up to 21 tons before the yielding feature takes over. They have a maximum weight-bearing strength of approximately 50 tons before damage may be expected to the jack after it has reached a closed position.

The yielding characteristic of the jack is an advantage as it permits the jack to serve as a visual warning device when excessive pressure is being exerted on the roof. The jack also serves as an audible warning device as a hissing sound that can be heard for a distance of 30 or 40 ft furnishes a warning signal to the workmen that there is a possibility of a roof failure.

The ripper-type continuous miners advance a 14-ft entry by means of two lifts, each 16 ft in length (Fig. 8) A single row of four posts on 4-ft centers, set parallel to the rib, comprises the temporary roof support before the second pass is made. At least the first two posts shown in the lower row must be installed before bolting of the roof is started. The roof bolters are then required to move the posts up to the next two positions to complete the bolting of the entry.

A new type hydraulic jack has been ordered for use in place of these wooden posts. The jacks, known as Hydro-Posts, extend to 84 in and may be handled by one man since they weigh only 50 lb. Their weight-bearing strength of 8 tons before starting to yield, and yielding to a maximum of 10 tons, is ample to support the limited expanse of exposed roof.

Experiments will be conducted with these jacks in this application. We are confident that their use as temporary roof supports while driving entries and pockets, and while installing roof bolts, will result in a saving of time and material, as well as a safer application for both machine operators and roof bolters because of speed of installation, the adequate roof support that they furnish, and the expedient and exposure-free means of recovery and removal from the area that they offer.

Back in the early nineteen hundreds—in the days of Henry Clay Frick, our predecessor company, the H. C. Frick Coke Co., operated under a slogan: "Safety First, Quality Second, Production Third."

Our method of extracting pillars with continuous miners conforms with that slogan. Safety has always been the first consideration in selecting our methods of extraction, ventilation, transportation, dust control, and roof control.

The method of leaving a minimum

of 8 in of roof coal and supporting it with roof bolts, along with header blocks or sawed planks when deemed necessary, has helped our control of the quality of our mined coal by supporting the draw slate and other noncoal strata and preventing them from being mixed with the coal.

Last, but not the least by any means, is our aim to effect the best possible production. The extraction of pillar blocks by means of the pocket-and-wing system with continuous mining machines affords our company the best possible production, consistent with safety.

Better than 85% recovery of coal is accomplished by means of this system, which we feel is of utmost importance, both from standpoints of economy and conservation. We feel that the best possible recovery of coal will tend to conserve our coal resources for the use of future generations.

To conform with the saying "The first shall be last," Frick District's first consideration, "Safety," shall be the substance of my closing affirmation. We of the Frick District feel that great strides have been made in the safety and efficiency of coal recovery with continuous mining machines, and that an estimable portion of this accomplishment may be attributed to the use of hydraulic yielding jacks as an aid in the support and control of the mine roof.



NEW SHOVEL, incorporating new control and design features, boosts stripping capacity while adding flexibility to operations. Elevated cab improves operator visibility.

New Shovel Boosts Stripping Capacity

Two-piece tamping plugs and 175-grain detonating fuse as primer also contribute to greater efficiency at western Kentucky operation. A SPECIAL long-range stripping shovel has boosted stripping capacity and added significantly to flexibility of operations at the Green Coal Co., Panther, Ky.



HORIZONTAL AUGER bores 8%-in holes on 16- to 25-ft centers to depths up to 70 ft. Overburden is mostly shale.



THREE STRANDS of 175-grain detonating fuse serve as primer for nitrate-oil mixture packaged in double bags.



BUSY SCENE in main pit includes 42-yd stripping shovel in background, 4-yd coal shovel and 50-ton coal hauler.

at Green Coal Co.

Going into service in the fall of 1960, the new Bucyrus-Erie 270-B works ahead of a 42-yd Bucyrus-Erie 1050-B and strips up to 50 ft of cover, freeing the larger shovel for duty

in banks up to 75 ft high. Providing the backbone of Green operations in the No. 9 seam these two stripping machines work around the clock, seven days a week. Overburden con-





TAMPING PLUGS, enclosed in plastic, reduce charging time per hole by one man-hour. Two sections are shown at right.

sists of gray shale and a thin layer of dirt.

The long-range 270-B incorporates many new design features, including new static control, a new crowd system, all-enclosed gear propelling, automatic lubrication and an elevated operator's cab for better visibility. The static control, a new concept in electric-excavator control, uses solidstate components in place of rotating units or electronic tubes. Since it has no moving parts and no deteriorating action takes place in the system, control life is expected to be unlimited. This system is said to be the first designed to obtain specific digging characteristics.

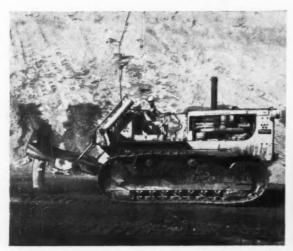
Equipped with an 8-cu yd dipper on a 54-ft handle, the 270-B has a 100-ft boom. It has a maximum cutting height of 91 ft, a maximum dumping height of 75 ft and a maximum cutting radius of 100 ft.

A Northwest 95 dragline with a 2½-yd Hendrix bucket and a Lima 2400 diesel shovel with a 4½-yd Esco dipper also add flexibility to Green stripping activities. The dragline handles the major ditching assignments and some overburden and the 4½-yd shovel uncovers coal in a second pit where cover is thinner. A Michigan 175 front-end loader follows the stripping unit and cleans up loose, fine dirt left on top of the coal.

Breaking the Overburden

Aside from maintaining a high degree of stripping flexibility with its assorted machines, Green Coal applies new ideas to get effective rock breaking. These ideas include using three strands of 175-grain detonating fuse for the full depth of hole as a primer for ammonium nitrate-oil blasting agent and two-piece tamping plugs to eliminate or decrease stemming in horizontal holes. By using two-piece tamping plugs instead of bagged drill cuttings for stemming, the company saves about one man-hour per hole in stemming time.

Tamping plugs, supplied by Austin Powder Co., are individually packed in polyethylene bags to prevent separation of the solid plug and the expansion cone. In tamping a hole, a worker pushes a plug against the blasting agent and then strikes it solidly with the tamping stick, thus forcing the wedge ahead and split-



HYDRAULIC RIPPER on rear of bulldozer breaks up coal for easy loading. Unit makes several passes to penetrate full seam.



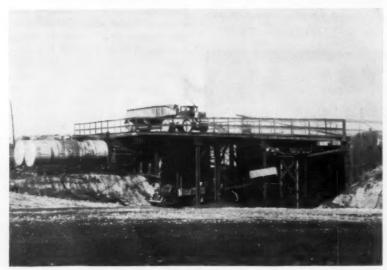
FRONT-END LOADER follows stripping units, skims off loose, fine dirt ahead of loading shovel.



DRAGLINE handles major ditching assignments and also helps to remove overburden.



DIESEL SHOVEL with 4½-yd dipper uncovers coal in second pit where overburden is thinner.



DESTINATION of 50-ton coal haulers is 550-ton storage bin adjacent to preparation plant from where it is conveyed to crushers.

ting the cone. This action seats the tamping plug solidly in the hole, much like roof-bolt anchorage.

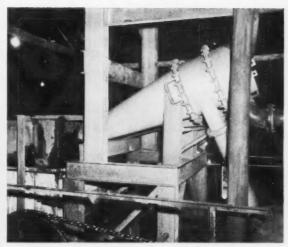
When the overburden is comparatively thin, the company frequently uses only the tamping plugs. But in thicker cover, company standards call for stemming outby the tamping plug.

Green Coal uses a McCarthy gasoline-driven horizontal auger to drill 8%-in holes to depths ranging from 35 to 70 ft. Auger sections are 5 ft long and the lead auger has an Austin head and AP8 finger bits.

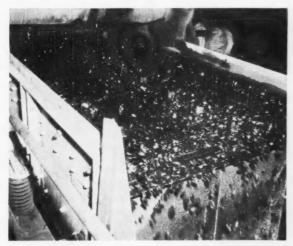
In the pit where the new 270-B and 1050-B shovels work, most holes are 50 ft deep but may be 70 ft. In the second pit, where the 4-yd shovel strips, holes are drilled only 35 ft deep. To meet varying conditions and assure proper distribution



CALCIUM-CHLORIDE WASHERS process all raw coal larger than ¼ in. One unit receives 6x1¼ feed, the second 1¼x¼.



CYCLONES thicken 1/4x0 before it passes to vibrator for dewatering and sizing.



VIBRATORS separate crushed clean coal into 1½x1, 1x½ and ½x0 fractions which are sent to separate storage bins.



CENTRIFUGAL DRYERS dewater clean ½x28M before it is conveyed to one of the storage bins.

of blasting agent, the company varies hole centers between 16 and 25 ft.

To detonate the charges, the company uses electric delay caps, Nos. 1 through 6, with three holes connected to each cap. Thus 18 holes are detonated in each shot. One of the three strands of 175-grain detonating fuse extends from each drillhole to provide a connecting link with other holes and the main fuse line.

Holes are charged with a mixture of Spencer N-1V ammonium nitrate prills in the ratio of 1 lb per 10 cu yd of overburden. Two men mix the nitrate and fuel oil in the field, using a small tank mounted on the supply truck. They then pack it in double Bemis bags which are cemented together with a tar compound to provide protection against

moisture. Two men, working on the day shift, mix the blasting agent, charge holes and set off all the shots.

Loading and Hauling

A Michigan 175 front-end loader follows the stripping units and skims off loose, fine dirt left by the stripping units. Then a Caterpillar D9 bull-dozer with a Kelly hydraulic ripper moves back and forth over the surface to break the coal for easy loading. A 25-ft-wide strip of coal next to the highwall is left intact as a road for haulage units.

A Northwest 80D diesel shovel with a 4-yd dipper loads coal into a fleet of six Dart 50-ton semitrailer trucks. Powered by Cummins NRTO 335-hp diesel engines, these units

carry 4,000 tons of coal 3½ mi to the preparation plant.

Preparing the Coal

Early in 1960, Green Coal added new preparation facilities which upgrade the quality of the finer products by reducing ash and moisture content. Designed and built by Fuel Process Co., Inc., the new facilities include a Belknap calcium-chloride washer for processing 11/4x1/4, thickening cyclones, CMI centrifugal dryers, conveyors, pumps and vibrators.

Haulage units discharge raw coal into a 550-ton bin adjacent to the preparation plant. From there coal feeds onto a 48-in conveyor belt leading to a Jeffrey 48x60 primary crusher that breaks it to 10 in top



FLEET of 17-ton semitrailers carries coal 15 mi to the company's loading dock at Owensboro.

size. It then flows to a secondary crusher that further reduces it to 6 in maximum size.

The 6x0 passes over an Allis-Chalmers vibrator that splits the raw feed into 6x1¼ and 1¼x0 fractions. The 6x1¼ flows to a Belknap calcium-chloride washer. After discharging onto a 5x14-ft Allis Chalmers Low-Head dewatering vibrator, the clean 6x1¼ drops onto a 36-in transfer conveyor leading to a pair of Ripl-Flo vibrators making a separation into 6x3, 3x2 and 2x0 sizes.

Two 24x40 Bond crushers reduce the 6x3 and 3x2 to 1½x0 which is sized on 4x14-ft Lecco-Vibe and 5x14 ft Ripl-Flo units into 1½x1, 1x½ and ½x0. These products then are delivered to separate storage bins. The 2x0 product from the primary clean-coal screening equipment flows directly to a storage bin.

Raw 11/4x0 is wet screened on a 7x20-ft Lecco-Vibe into 11/4x5/8, 5/8x 1/4 and 1/4x0 products. The two larger sizes pass to a second Belknap calcium-chloride washer. Clean coal from this washer discharges onto a 5x14-ft Hewitt-Robins vibrator making a separation into 11/4x1/2, 1/2x 28M and 28Mx0. The 14x1/2 is conveyed to a 5x14-ft Ripl-Flo and screened into 11/4x1, 1x1/2 and 1/2x0 sizes, which are then delivered to storage bins. The 1/2x28M flows to three CMI centrifugal dryers for mechanical dewatering before delivery to a storage bin.

Raw 1/4x0 from the wet screen flows to a sump from which it is pumped to two Heyl & Patterson 24-in thickening cyclones. Underflow



SUPERINTENDENT Royal Scott directs activities at Green Coal.

Green Officials

Robert E. Green, Owner William Maglinger, Sales Manager Royal Scott, Superintendent William Evans, Chief Electrician Fred Reeves, Pit Foreman Rutherford Clark, Preparation Foreman Dallas Hill, Maintenance Foreman Alton Alford, Office Manager

from these units discharges onto a 5x14-ft Lecco-Vibe unit that removes the 28Mx0 and delivers the ¼x28M to the centrifugal dryers. The 28Mx 0 is pumped to a settling pond.

To eliminate the possibility of bothersome gob fires, the company hauls plant refuse to the spoil area and buries it. Part of the spoil area also serves as a settling pond for 28Mx0 solids. Another section of the spoil area has been converted to a storage pond which provides fresh water for the preparation plant. Slurry and fresh water are handled by Goyne pumps.

Green Coal owns barge-loading facilities on the Ohio River at Owensboro, some 15 mi from the scene of operations. The river dock holds 12 empty barges and 10 loads. A fleet of 28 hired trucks, including GMC and International units with 17-ton semitrailers, carries clean coal to the river. There they discharge into a 60-ton hopper feeding a 48-in belt that leads to the river. The company has its own harbor boat for handling barges.

Auxiliary Equipment

To handle road building, grading, cleanup and other miscellaneous jobs, the company has the following machines available: two LeTourneau scrapers pulled by Caterpillar D8 tractors, a Michigan 75A front-end loader for cleanup and stockpile work, a Caterpillar No. 12 motor grader for road maintenance, three D8, one D7 and one D6 bulldozers for utility service and three Ford F-100 pickup trucks for supervisor transportation. To provide better communication between supervisors, equipment operators and the office, the company relies on Motorola shortwave radios. Sets are installed in supervisory vehicles, office, scalehouse and preparation plant.

EEP OPENINGS ee and c DRICK R

Something has been added to Hendrick Wedge Wire Screen. That's right! Wedge Wire is now available with a Riffle Top profile bar for tops in dewatering efficiency and long service life. Exclusive Riffle markings on the upper surface of the wedge wire guide fluids directly to openings for greater draining capacity. And — the Riffles also lift over-size particles above the screens normal opening level . . . keep wear caused by abrasion down to an absolute minimum. For more information on Hendrick Wedge Wire's free clearance; rugged mechanical and lateral strength; extra load carrying capacity and large percentage of open area, call your local Hendrick representative or mail the coupon today.

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HENDRICK Manufacturing Company 41 Dundaff Street, Carbondale, Pennsylvania Gentlemen: I want more information on Hendrick Wedge Wire and Riffle Tops. Please have representative call Please send FREE literature NAME TITLE COMPANY. STREET ADDRESS. CITY. STATE



STATIC

Step up and meet the big 270-B . . . longest range 2-crawler stripping shovel ever built! There's a new crowd system . . . all-enclosed gear-propelling . . . automatically lubricated, all-enclosed main machinery . . . and dynamic STATIC CONTROL. Here's control that lets you handle this million-pound giant like a small rig . . . that eliminates rotating parts and expensive electronic tubes. It delivers split-second response with a higher bail pull at any selected speed, reduces shock loading and puts the greatest digging force and speed to work the instant they're needed. It's control like you've never seen before . . . it's STATIC CONTROL — first by Bucyrus-Erie. Your operations can use this kind of performance . . . and we'll rush you all the details if you'll write Bucyrus-Erie Company, South Milwaukee 1, Wisconsin.



1161

1960 Sales: Coal-Mining And Cleaning Equipment

W. H. Young, Chief, Sec. of Bituminous Coal and Lignite

R. L. Anderson, Supervisory Commodity-Industry Analyst, Bureau of Mines, U. S. Dept. of the Interior

SHIPMENTS of mechanical-loading equipment for underground use in coal mines in the United States, in terms of capacity, decreased 3% in 1960 from 1959. The capacity of mechanical cleaning equipment sold for use at bituminous coal mines was 35% greater in 1960 than in 1959.

This survey was made possible by the cooperation of manufacturers of mechanical cleaning equipment for bituminous coal mines and of mechanical loading and supplementary haulage equipment and coal-recovery augers for use in all coal mines in the United States. Information from trade journals also was used.

Sales of mechanical-loading units, coal-recovery augers, and supplementary haulage equipment in 1960, as in previous years, represent shipments during the year. Of the total capacity of mechanical-cleaning equipment sold in 1960, 60% was placed in operation during that year; the remainder (40%) will be installed later.

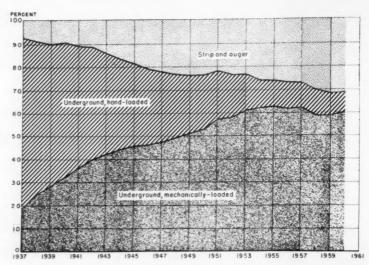


FIG. 1—Percentage of total production of bituminous coal and lignite in the U. S. by type of mining and loading, 1937-60.

Mechanical Loading and Mining

Production of bituminous coal and lignite increased from 412 million tons in 1959 to an estimated 413 million tons in 1960. The percentage of total production produced by underground, strip and auger mines was virtually the same in 1960 as the previous year.

Table I shows bituminous coal and lignite production, by methods of mining and loading and by mechani-

Table I—U.S. Bituminous and Lignite Production, By Methods of Mining and Cleaning 1956-60

		Thousand	net tons-		Pe	rcenta	ge of to	tal
	1956	1958	1959	1960*	1956	1958	1959	1960*
Underground Mines:**					-		**********	
Continuous mining only	8,667	12,151	16,287	21,000	1.7	3.0	4.0	5.1
Mixed continuous and conven-								
tional mining	105,385	109,577	108,973	108,000	21.0	26.7	26.4	26.1
Conventional mining only:								
With mechanical loading	201,647	124,105	119,879	121,000	40.3	30.2	29.1	29.3
With hand loading only	50,075	41,051	38,295	35,000	10.0	10.0	9.3	8.5
Total	365,774	286,884	283,434	285,000	73.0	69.9	68.8	69.0
Strip mines	127,055	116,242	120,953	120,000	25.4	28.3	29.4	29.1
Auger mines	8,045	7,320	7,641	8,000	1.6	1.8	1.8	1.9
	-							
Total, all mines	500,874	410,446	412,028	413,000	100.0	100.0	100.0	100.0
Mechanically cleaned	292,365	259,035	269,787	280,000	58.4	63.1	65.5	67.8

^{*}Preliminary **Similar data for other years not available

Table II—Productivity at Underground Bituminous and Lignite Mines, by Methods of Mining and Loading, 1956, 1958 and 1959*

Method of mining	Avera	ge Tons pe per Day-	r Man	—Nur	nber of Mi	nes	-Productio	on (thousand	net tons)—		ge of Une	derground
and loading	1956	1958	1959	1956	1958	1959	1956	1958	1959	1956	1958	1959
Continuous mining only	14.08	13.06	13.97	24	45	59	8,667	12,151	16,287	2.4	4.2	5.8
Mixed continuous and con- ventional mining	9.46	10.75	11.33	132	167	165	105,385	109,577	108,973	28.8	38.2	38.4
Conventional mining only: With mechanical loading. With hand loading only	9.26 5.65	10.06 5.77	11.26 5.73	1,086 5,300	954 5,153	879 4,712	201,647 50,075	124,105 41,051	119,879 38,295	55.1 13.7	43.3 14.3	42.3 13.5
Total, underground	8.62	9.38	10.08	6,542	6,319	5,815	365,774	286,884	283,434	100.0	100.0	100.0

[&]quot;Similar data for other years not available,

cal cleaning, for 1956 and 1958-60. Underground production decreased from 73% of the total in 1956 to 69% in 1960. Production at mines using continuous mining machines increased from 23% of the total in 1956 to 31% in 1960. The percentage of total production of bituminous coal and lignite in the United States, 1937-60, by type of mining and loading is shown in Fig. 1. During 1960 approximately 91% of the total output was mechanically loaded at underground mines, loaded by power shovels at strip mines, or mined by augers along highwalls.

Productivity by methods of mining and loading at underground bituminous coal and lignite mines is shown in Table II for 1956, 1958-59. Similar data for other years are not available. There is a small amount of hand-loaded tonnage at mines with mechanical loading. However, it is less than 1% of their total production.

Auger Mining—Augers are used for coal recovery along highwalls in strip mines and on bench operations where coal cannot be economically mined by stripping. Separate data on the number of augers in use and the tonnage produced by auger mining were first collected for 1952.

Reports from three manufacturers of coal-recovery augers show that 25 augers were shipped in 1960 compared with 47 in 1959, a decrease of 47%. All augers shipped in 1960 were for surface use. Table III shows coal-recovery auger shipments in 1956-60, and Table V, the number in use in 1959 and shipments in 1960, by states.

Types of Units Sold—Table III lists the units of mechanical loading and mining equipment shipped for use at coal mines in the United States, 1956-60. Shipments of mobile loading machines and bridge conveyors increased, while all other types of equipment decreased in 1960 from 1959. There were no scraper loaders shipped in 1960.

Types of Mechanical - Loading Equipment Sold Compared With Units in Use—Table IV shows the trend in demand for various types of mechanical-loading equipment. Continuous mining machines were first used in 1948. However, they were not shown separately until 1952.

Table III—Mechanical-Loading and Mining Equipment Sold for Use in Coal Mines, as Reported by Manufacturers

Type of Equipment	1956	1957	1958	1959	1960	Change from 1959 (Percent)
Bituminous coal and lignite mines:		-		-	_	
Mobile loading machines	239	209	97	95	110	+15.8
Continuous-mining machines	154	168	107	140	128	- 8.6
Coal-recovery augers	89	53	42	47	25	-46.8
Shuttle cars			1	4.4.4	- 4.4	****
	560	488	181	233	219	- 6.0
Gathering and haulage conveyors	137	172	97	118	92	-22.0
Room or transfer conveyors ¹	232	159	92	65	47	-27.7
Bridge conveyors	128	96	66	61	68	+11.5
Anthracite mines (Pennsylvania):						
Mobile loading machines	***	1		2		
Continuous mining machines		1		111		
Coal-recovery augers		2	3			
Shuttle cars	2	2	-			* * * *
Gathering and haulage conveyors2		2		4	2	50.0
Room or transfer conveyors	19	45				-50.0
Bridge conveyors	-		21	23	3	-87.0
Number of second states	A A W	1	***	2	* * *	* * * *
Number of manufacturers reporting	22	21	18	17	18	****

¹Reported as scrapers or scraper haulers and hoists

Table IV—Sales of Mechanical-Loading Equipment in 1960 Compared with Machines in Use in Preceding Years

	Number		Reported	in Use, as	reported	Sales.
	1955	1956	1957	1958	1959	1960
Bituminous coal and lignite mines:					-	-
Mobile loading machines	3,819	3,854	3.755	3.434	3.121	110
Continuous mining machines	385	510	614	679	776	128
Scrapers	23	35	14	7 1	1	
Conveyors equipped with duckbills or				1	144	
other self-loading heads	487	437	361	242		47
Hand-loading room conveyors, number				/		
of units	1,925	1.819	1.528	1.230	1.014	
Anthracite mines (Pennsylvania):				-,	,,,,,	
Mobile loading machines	79	80	66	51	46	
Scrapers	279	303	295	290	186	
Hand-loaded room conveyors, number					200	
of units*	1,940	1.593	1.437	1.234	869	3
				-,,	302	

*Includes pit-car loaders and conveyors equipped with Duckbills or other self-loading heads

The number in use has increased every year from 1952 to 1959. Shipments of continuous mining machines in 1960 were 17% of the number in use in 1959. Mobile-loading-machine shipments in 1960 were 4% of the number in use in 1959.

Table V shows the number of mechanical-loading units and coal-recovery augers shipped to various states in 1960 compared with the number in use in 1959, as reported by mine operators. Sales of room conveyors as listed in Table V are not exactly comparable with the number of room conveyors in use. To avoid duplication in tonnage mechanically loaded, each mine operator was instructed to report "hand-loaded" and "self-loading" conveyor tonnage only. Therefore, conveyors loaded by mo-

bile loading machines and continuous-mining machines are not included with "Room conveyors in use in 1959." Shipments of coal-recovery augers to bituminous coal mines in 1960 were 8% of the total number in use in 1959.

Haulage Equipment

Bridge Conveyors—Sales of bridge conveyors increased 8%, from 63 in 1959 to 68 in 1960. Shipments by states are listed in Table VI.

Shuttle Cars—Sales of shuttle cars decreased from 233 in 1959 to 219 in 1960. Details of shipments to various states in 1959 and 1960 are given in Table VI. Exports of shuttle cars in 1960 amounted to approxi-

Includes all haulage conveyors with a capacity over 500 ft, except main slope conveyors

Includes all haulage conveyors with capacity of 100 to 500 ft, except main slope conveyors

Table V—Mechanical-Loading and Mining Equipment in Use in 1959, by States, Compared With Sales Reported in 1960

	Mobile Loading —Machines—		Mining Machines		Room Conveyors1		Coal-Recovery	
	In Use, 1959	Sales, 1960	In Use, 1959	Sales, 1960	In Use, 1959	Sales, 1960	In Use, 1959	Sales, 1960
Alabama	109	20	20	4	72	4	3	
Arkansas	2		1	1	16	* *		**
Colorado	55	1	13	2	79			
Illinois	131	1	39	7	11	* *	2	
Indiana	82		4	4	* *	* *		
Iowa	4							
Kentucky	416	22	47	7	49	1	85	8
Maryland		1	* *	**	21	6		
Montana	7		* *	* *	7			**
New Mexico	2		3		1			
Ohio	98	3	35	2	33	1	60	5
Oklahoma	6				79			
Pennsylvania	577	15	306	25	351	5	38	7
Tennessee	28		1	3	26	1	13	1
Utah	132	1	22	4	3			* *
Virginia	177	3	17	1	9	**	35	1
Washington	4		6		14	* *		
West Virginia	1.277	43	260	68	348	29	95	3
Wyoming	14	* *	2	**	39			
Total	3,121	110	776	128	1,158	47	331	25
Anthracite mines								
(Pennsylvania)	46	• •		**	1,0552	3	3	
Grand total	3,167	110	776	128	2,213	50		25

¹Includes hand-loaded conveyors and conveyors equipped with Duckbills or other self-loading heads ²Also includes pit-car loaders

Data not available

Table VII—Bituminous Coal Mechanically Cleaned in 1959, Compared With 1960 Sales of Equipment

		1959		
State	Number of Plants in Operation	Net Tons of Cleaned Coal	Output Mechanically Cleaned (Percent)	Annual Capacity of Equipment Sold in 1960 (Net Tons) ¹
Alabama	34	10,804,883	90.4	2
Alaska	3	251,319	38.1	
Arkansas	3	3	P2	
Colorado	34	1,010,6874	30.74	
Illinois	58	43,410,877	95.5	1,250,000
Indiana	20	10,390,104	70.2	
Kansas	4	705,699	91.4	
Kentucky	81	42,070,715	67.0	970,000
Maryland				2
Missouri	8	1,922,854	70.0	**
Montana	1	9,833	6.5	
New Mexico	1	67,153	45.2	**
Ohio	23	15,897,365	45.3	740,000
Oklahoma	3	456,526	29.9	**
Pennsylvania	89	38,921,850	59.6	1,810,000
Tennessee	1	32,086	.5	0.0
Utah	6	2,998,015	66.0	2
Virginia	29	14,030,556	47.1	760,000
Washington	5	230,571	95.2	
West Virginia	184	86,523,323	72.3	9,500,000
Wyoming	2	52,271	2.6	
Undistributed	**			959,000
Total	555	269,786,687	65.5	15,989,000

Based on average days mines were active in 1959 and 7.0 hr per day

Included in "Undistributed."

Included in Colorado.
Includes Arkansas.

mately 18% of the 1960 sales in the

Gathering and Haulage Conveyors

-For the purpose of this study,

"Gathering and haulage conveyors" include sectional, extensible power-driven conveyor units that can handle over 500 ft of conveyor. Main slope conveyors are excluded. Table III

Table VI—Units of Conveying Equipment Sold for Use in Coal Mines, 1959-60, by States

	Bridge con-		Shu	ttle	Gathering and haulage convey-		
	1959	1960	1959	1960	1959	1960	
Alabama	6	3	24	41	10	14	
Alaska					5		
Arkansas	1	1					
Colorado			5	1	1	1	
Illinois		1	3	10	1	10	
Indiana					2	7	
Kentucky			10	19	6		
Maryland		2				1	
New Mexico			6		1		
Ohio			8	14		11	
Oklahoma					2		
Pennsylvania	10	18	43	45	16	13	
Tennessee	2	2			2		
Utah				11	2	1	
Virginia			25	2	11	9	
West Virginia		41	109	76	59	25	
Total	61	68	233	219	118	92	
Anthracite mines (Penna	.) 2			**	4	2	
Grand total.	63	68	233	219	122	94	

*Includes all gathering and haulage conveyors with capacity over 500 ft, except main slope conveyors.

lists sales for 1956-60, and Table VI shows shipments by states in 1959 and 1960.

Mechanical Cleaning

Reports from 23 manufacturers of bituminous-coal cleaning equipment show that the total capacity of 1960 sales was 12,150 net tons of clean coal per hour, compared with 9,025 tons of capacity sold in 1959, an increase of 35%. Sales in 1960, by type of equipment, in terms of capacity, show that dense medium ranked first, followed by jigs, wet tables, pneumatic and flotation.

The capacity of all types of equipment sold in 1960 for cleaning bituminous coal by wet methods was equivalent to 6% of the bituminous coal cleaned by wet methods in 1959, and the capacity of pneumatic equipment sold in 1960 was also 6% of the bituminous coal cleaned by pneumatic methods in 1959. Approximately 65% of the total capacity of cleaning equipment sold in 1960 was for additions or replacements to present installations and the remaining 35% was for new plants.

Table VII gives data on bituminous coal cleaned in 1959, and the annual capacity of equipment sold in 1960, by states.



Documentary movie shows how non-stop haulage achieved with fewer men and less equipment

A year was necessary to film, at intervals, the operations you will see in this actual case history of a change-over to S-D Automatic Overlapping Cars. It shows operations BEFORE . . . DURING . . . and AFTER conversion to a main line haulage system that reduced cost to the minimum and provided Non-Stop Maximum Haulage — with fewer men and less equipment. It further features Automatic Loading Stations, what they do and how they operate in this mine. This documentary 22-minute color

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Install headed roof bolts in four simple steps



DRILL THE HOLE to required depth and diameter with rock drill. Maximum strength is obtained when the hole is drilled perpendicular to the roof surface.



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BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. Export Sales: Bethlehem Steel Export Corporation

Bethlehem roof bolts are designed to minimize the probability of troublesome and often dangerous roof falls.

Bethlehem also makes slotted bolts. These are installed so that a steel wedge spreads the split bolt ends, causing them to grip the rock tightly and securely.

For all the details on Bethlehem roof bolts call your nearest Bethlehem sales office. You might also like to see a copy of our 20-page, illustrated catalog on roof bolting. Write us at Bethlehem, Pa., for your copy.







for Strength
... Economy
... Versatility



TIGHTEN THE ASSEMBLY with an impact wrench to complete the installation. When tightened in the hole the leaves of Bethlehem's Type "C" expansion shell expand in four directions to lock the bolt securely in place.



4 TEST THE INSTALLATION to assure the accuracy of equipment and bolting crews. Tension testing may be performed at regular intervals. Bethlehem engineers are available to work with your crews on any aspect of the job.

BETHLEHEM STEEL



1960 Preparation Sales

Though number of preparation projects dropped, total capacity contracted for ran only slightly behind 1959. Heavy-medium washers, tables, flotation units, fluid-bed dryers and water-handling circuits were major items in the 1960 contract picture.

IN TERMS OF number of projects there was a sharp drop in preparation activity in the bituminous industry in 1960. Compared to something over 100 projects in 1959, including those received after the annual tabulation was published in February, 1960, the total for 1960 was something over 70. The 1960 list as of the time of closing of this issue of Coal Age appears in the accompanying tabulation.

The total hourly rated capacity of the 1960 projects, however, was only slightly under that of 1959. In 1960 the total capacity of the facilities represented by all the contracts was probably 14,500 tph or slightly more. The capacity of the facilities involved in the 1959 contracts was probably 15,750 tph or a little more. In terms of cleaning capacity, as a matter of fact, according to the Bureau of Mines summary elsewhere in this issue, 1960 represented an increase of 35% over 1959.

Activity in anthracite presented a picture similar to bituminous—i.e., the number of projects was down but the total capacity was not far behind that contracted for in 1959.

So. W. Va. the Leader

Districts 7 and 8-particulary 8-again let the lion's share of the contracts. In fact, these two districts substantially increased their share of the total. In 1959, these districts (east Kentucky, Virginia and southern West Virginia) let contracts for about 45% of the total projects. In 1960 their share of the total moved up to about 60%.

Southern West Virginia alone accounted for nearly one-third of the 1960 projects.

Cleaning Facilities

Heavy-medium equipment was, as in other recent years, chosen by most of the companies placing orders for new facilities. Several new units were offered by manufacturers al-

New Bituminous Preparation Facilities

Coal Company	Plant Location	Capacity, TPH	Preparation Equipment
Amigo Smokeless Coal Co	Wyco, W. Va.	***	Heyl & Patterson ¹ J. O. Lively ¹
Badger Coal Co	Phillipi, W. Va.	60	McNally Pittsburg®
Bankhead Mining Co	High Level, Ala.	275	McNally-Pittsburg ⁵¹ Roberts & Schaefer ²
Bethlehem Mines Corp	Barrackville, W. Va.	670	Jeffrey² Western Machinery²
	Idamay, W. Va.	670	Roberts & Schaefer ³ Jeffrey ³
Buckeye Coal Co	Nemacolin, Pa.	225	Nelson L. Davist
Camp Fork Coal Co	Summersville, W. Va.	300	Daniels ¹
Cannelton Coal & Coke Co	Cannelton, W. Va.	60	Kanawha ⁶ Cent. & Mech. Ind. ⁶
Carbon Fuel Co	Winifrede, W. Va.	500	Kanawha ⁷
Carpentertown Coal & Coke Co	Mahoning, Pa. (3)	32	Deister Concentrator
Cherry River Coal & Coke Co	Fenwick, W. Va.	•••	Dorr ⁰ Ducon ⁰ Link-Belt ¹⁰
Clinchfield Coal Co., No. 2	Clinchfield, Va.	42	Western Machinery ¹⁰
	}		Heyl & Patterson ⁴¹
		85 400	Kanawha ¹¹ Link-Belt ¹²
		400	
Clinchfield Coal Co., No. 3	Clinchfield, Va.	50	Link-Belt13
		100	Peterson Filters ¹⁴ McNally Pittsburg ³⁰
Collins Mining Co	Ironton, Ohio	250 150	Daniels ⁵
Crystal Block Coal & Coke Co	Sarah Ann, W. Va.		
1	Thacker, W. Va.	75	Ridge Equipment ¹⁵
Driscoll Coal Co	Cresson, Pa.	75	Ridge Equipment ¹⁵
Dry Fork Pocahontas Coal Co	laeger, W. Va.	45	McNaily Pittsburg ²¹ Roberts & Schaefer ¹⁶ Deister Concentrator ¹⁶
Eastern Gas & Fuel Associates	Grant Town, W. Va.	950	Dorris Duconis Western Machineryis
Elkfoot Coal Co	Mouthcard, Ky.	200	Daniels ⁵
Elk River Coal & Lumber Co	Widen, W. Va.		Ind. Engr. & Const.17
(W. Frankfort, III.	750	McNally Pittsburg®
Freeman Coal Mining Corp	Waltonville, III.	200	Nelson L. Davist
(Logan, III.	128	Heyl & Patterson ¹²
Giogora Coal Co	Blue Pennant, W. Va.	400	Ind. Engr. & Const. ¹⁵
Guardian Coal Co	Gilmer, W. Va.	60	McNally Pittsburg ¹⁸ Cent. & Mech. Ind. ¹⁹
Hampton Coal	Greenville, Ky.	70	McNally Pittsburg54
Hanna Coal Co	Georgetown, Ohio		Heyl & Patterson ¹
Harlan Fuel Co	Yancey, Ky.	50	Daniels ¹⁹
High Splint Coal Co	High Splint, Ky.		Mech. Eq. & Const.30
Hyasota Fuel Co	Jerome, Pa.	55	Ridge Equipment ¹⁴
Ideal Elkhorn Coal Co	Robinson Creek, Ky.	140	Jeffrey ²¹ Roberts & Schaefer ²²
Imperial Smokeless Coal Co	Carl, W. Va.	550	Deister Concentrator ²³ Eimco ²³ Heyl & Patterson ²³
			Western Machinery ²³ Link-Belt ²³ Deister Concentrator ²³
Island Creek Coal Co	Algoma, W. Va. (8)	120	Eimco ²³ Western Machinery ²³ Heyl & Patterson ²³
	Amherstdale, W. Va. (2)	24	Roberts & Schaefer ²⁴
Joanne Coal Co	Rachel, W. Va.	45	Link-Belt ²³ Western Machinery ²³ Kanawha ²⁶
Johnstown Coal & Coke Co	Nettie, W. Va.	200	Dorr ²⁵ Eimco ³⁶ Western Machinery ²⁸
Kaiser Steel Co	Sunnyside, Utah	26	McNally Pittsburg

ready in the business, as well as others now coming into the picture. Cyclones for fines, a new addition to the list of heavy-medium washers, were contracted for by additional mines as a result of favorable experience with the first units.

Fine Coal-The coal-washing table

again led the list in units installed or contracted for cleaning fines in the "Normal" range, though other equipment, such as the cyclone previously mentioned, upward-current feldspar washers and the like also were employed. Acceptance of the double-decked table by the bituminous industry was reflected in the

fact that sales were almost 100% of the total installed.

In the field of "ultrafines," flotation made additional gains in 1960.

Air Cleaning-Activity in this field was limited almost entirely to sales of a new unit which came on the market in 1960. Installations were made in Pennsylvania and West Virginia, and involved a total of 12 machines. Packaged-unit design is said to permit trucking the cleaners in and installing them with a minimum of plant reconstruction. Capacities sold ranged from 55 to 75 tph.

Contracted for in 1960*

Coal Company	Plant Location	Capacity TPH	Preparation Equipment
Larsen Coal Co	Winburne, Pa.	75	Ridge Equipment ¹⁵
Lady Jane Collieries	Pennfield, Pa.	150	Williams & Green®
Leader Coal Co	Elkins, W. Va.	75	Ridge Equipment ¹³
E. L. Jones Coal Co	S. Fork, Pa.	100	Irvin-McKelvy
Kentucky Mountain Coal Co	Manchester, Ky.	125	Daniels ¹
Leckrone Coal & Coke Co	McClellandtown, Pa.	75	Jeffrey ²⁷
Lester Coal Co	Grundy, Va.	125	Irvin-McKelvy ³³
Mather Collieries Co	Mather, Pa.		Heyl & Patterson ¹
Maust Coal & Coke Co	Richwood, W. Va. (11)	256	Deister Concentrator ^a Heyl & Patterson ¹
Nassau Coal Co	Black Wolf, W. Va.	15	Kanawha ^s Deister Concentrator ^s
New River Co	Summerlee, W. Va.	200	Fuel Process ²⁰ J. O. Lively ²⁰
New River Co	Lochgelly, W. Va.		J. O. Lively ⁵⁵
1	Oakwood, W. Va.		J. O. Lively ⁵⁵
New Shawmut Mining Co	St. Marys, Pa.	75	Ridge Equipment ¹⁵
North American Coal Corp	E. Springfield, Ohio	300	Daniels ⁵
1	Seward, Pa.	400	Irvin-McKelvy30
Page Coal & Coke Co	Pageton, W. Va.	250	Fuel Process ¹¹ Kanawha ²¹
Peabody Coal Co	New Lexington, Ohio	750	McNally Pittsburg
		480	Heyl & Patterson ¹³
Pecks Run Coal Co	Buckhannon, W. Va.	50	Prins ¹²
		80	Heyl & Patterson ⁴
Perkins-Harlan Coal Co	Liggett, Ky.	150	Jeffrey ²⁷
Pocahontas Empire Coal Co	Keystone, W. Va.	220	Danielei
	Vivian, W. Va.	350	Daniels!
Pocahontas Fuel Co., Inc	Itmann, W. Va. (3)	100	Deister Concentrator
	Itmann, W. Va. (5)		Western Machinery ¹³
Raleigh Empire Coal Co	Raieigh, W. Va.	175	Daniels ⁵
Rice Bros. Coal Co	Osceola Mills, Pa. (3)	150	Ridge Equipment ¹⁵
Rich Hill Coal Co	Cresson, Pa.	75	Ridge Equipment ¹⁵
Rochester & Pittsburgh Coal Co	Homer City, Pa.	28	Heyl & Patterson ⁽³
Russell Coal Co	Lebanon, Va.	40	Fuel Process ³⁴
Sandy Run Fuel Corp	Kingwood, W. Va.	55	Ridge Equipment ¹⁸ Kanawha ¹⁸
Slab Fork Coal Co	Slab Fork, W. Va.	3	Dorrss Heyl & Pattersonss Eimcoss
South-East Coal Co	Irvine, Ky.		
Southern Electric Generating Co	Maylene, Ala.	316	Roberts & Schaefert Jeffreyt
G. A. Stiles Co	Lucinda, Pa.	150	Irvin-McKelvy38
Stonefort Coal Mining Co	Wyoming, III.	160	Holmes Bros.30
Tioga Coal Co	Tioga, W. Va.	* * *	Heyl & Patterson ⁴⁵
U. S. Steel Corp	Robena, Pa. Gary, W. Va.	300 900	Link-Belt ⁴⁰ Kanawha ⁷
Utility Coal Co	Marion, III.	75	Daniels ¹⁹
Valley Coal Co	Heilwood, Pa.	55	Ridge Equipment ¹⁵
Virginia Iron, Coal & Coke Co	Toms Creek, Ky.	75	Jeffrey ²¹
(Maben, W. Va. (8)	150	Deister Concentrators
	Maben, W. Va.	40	Eimco ²⁶
	Maben, W. Va.	160	Heyl & Patterson ⁴
			J. O. Lively"
Winding Gulf Coals			Fuel Processii
-	East Gulf, W. Va.	250	J. O. Lively ¹¹
			Heyl & Patterson
(Riffe Branch, W. Va.	170	Fuel Process ²⁰ J. O. Lively ²⁰

Anthracite*

Greenwood Mining Corp	Coaldale, Pa.	733	Western Machinery®
Jeddo-Highland Coal Co	Harleigh, Pa.		Western Machinery ¹⁸ Heyl & Patterson ¹
Locust Valley Coal Co	Mahanoy City, Pa.	* * * *	Roller ¹⁶
Yellow Flame Coal Co	Hazieton, Pa. (4)	47	Deister Concentratori

*Includes contracts for installation of new preparation equipment in existing structures. Where more than one equipment item was installed, the number, when known, is shown in

stalled, the number, when known, is shown in parentheses following the plant address.

1. H & P cyclones. 2. Jeffrey Baum-jig addition (3 cells, 150 tph), Dutch State Mines heavy-medium cyclones, R&S Hydro cyclones, Wemco Fagergren flotation—R&S prime contractor. 3. Jeffrey Baum-jig addition (3 cells, 150 tph), Dutch State Mines heavy-medium cyclones, R&S Hydro cyclones, Hydrotator flotation unit. 4. Neldco heavy-medium processors. 5. DMS. denne-medium processors. 5. DMS. denne-medium-processors.

sor. 5. DMS dense-medium plant.
6. CMI drying installation—Kanawha prime 6. CMI drying installation—Ranawna prime contractor. 7. Raw-coal storage, handling and crushing. 8. Concenco No. 77 double-deck tables with two Concenco feed distributors for Imperial Smokeless. 9. FluoSolids dryer with Ducon dust collection. 10. Wemco Fagergren flotation and centrifugal dryer-Link-Belt prime

11. Drying installation. 12. Tank-type heavy-medium concentrator. 13. Refuse filter. 14. Dual Guide disc filter. 15. Ridge Airjig plant.

Guide disc filter. 15. Ridge Airjig plant.

16. Dutch State Mines heavy-medium vessel,
Concenco No. 77 double-deck tables, Wemco
Fagergren flotation, Dorrco FluoSolids dryer
with Ducon dust collection—R&S prime contractor. 17. Rescreening facilities. 18. McNally
feldspar jig, CMI dryer. 19. Fine-coal dryer.

20. 2,000-ton storage and blending installation.

20. 2.000-ton storage and blending installation.
21. Unit washery. 22. Including Dutch State
Mines heavy-medium vessel, Concenco No. 77
double-deck tables, Wemoo Fagergren flotation,
H&P fluid-bed dryer, Eimco fliters and thickeners—R&S prime contractor. 23. Concenco No.
77 double-deck tables, Eimco Agidisc filters for
refuse and coal, Wemco Fagergren flotation,
H&P cyclones—Link-Belt prime contractor.
24. Eimco thickener and Agidisc filter—R&S
prime contractor. 25. Wemco Fagergren flotation—Link-Belt prime contractor.
26. Wemco separator, ORC washer, Eimco

26. Wemco separator, ORC washer, Eimco static thickener, filter—Kanawha prime contractor. 27. Diaphragm jig. 28. Cleaning plant. 29. M-7 heavy-medium washer and accessory equipment—joint venture. 30. Coal-storage system with 3,500-ton Neff & Fry bins.

Primary and secondary heavers and accessories—Kanawha heavy-medium washers and accessories—Kanawha subcon-tractor for Page; joint venture for Winding Gulf. 32. Prins washer. 33. Wemco Fagergren flotation. 34. Belknap calcium-chloride washer. 35. Recovery circuit with Dorr thickener, H&P

cyclone—Kanawha prime contractor.

36. Eimco Agidisc filter. 37. Jeffrey Baum jig—R&S prime contractor. 38. Storage and jig—R&S prime contractor. 38. Storage and screening installation. 39. Baughman dryer. 40. Heavy-medium vessel.

40. Heavy-medium vessel.

41. Reineveld dryer, H&P cyclones. 42. H&P fluid-bed dryer, 43. H&P froth-flotation cells.

44. H&P mechanical and fluid-bed dryers, cyclones.

45. Automatic specific-gravity control. 47. SuperDuty No. 7 Diagonal-Deck tables. 48. Wemco separtor. 49. Cleaning plant, 800-ton storage, Williams & Green multi-slate ejector.

50. McNally Norton rewash. 51. McNally Norton washer. 52. McNally dense-medium equipment, Norton washer tables. 53. Flotation. 54. McNally fine-coal desliming, Bird centrifuging. 55. Water-clarification system cyclones and filter screens.

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a as in the excernote more was the ser comp alfen shound special componies at the it quinterly Time corporations the third quarter. the continue Wasse ere \$1.1 billion, e second quarter, n artes showed sales an even worse the better third us to makes was the a grain in caming a ter of 18.3%, com: a second quarter. aver 19 conse of only 1% ed gross reconnec langery form of the off transfer. a began to christ ald a sursupply of ets kept erseping have third quarter with though of a

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24 Westinghouse Main Drive **Motors and Control to Power Largest Mobile Land Machine Ever Built**

14,500 Horsepower to Drive Bucyrus-Erie's New 14,000,000-**Pound Giant Shovel** for Peabody Coal Co.

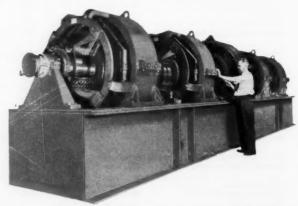
Westinghouse electrical equipment powerful, fast and reliable-will drive this huge shovel. For digging there will be eight 625-hp d-c hoist motors, six 500-hp d-c swing motors, and two 500-hp d-c crowd motors. A separate d-c generator will power each motor. The generators will be assembled into four M-G sets, each driven by a 3000-hp synchronous motor. Eight 250-hp a-c motors will power the crawler propel drives. Dozens of smaller motors will power various auxiliary drives.

Modern Magamp-exciter control provides smooth performance and fast response of the main d-c drives with minimum current overshoot. Flexible and easily adjustable, this control permits selection of optimum motor performance characteristics needed for any particular digging

With Westinghouse Magampexciter control for the hoist, swing and crowd, the huge machine will have a 50-second digging cycle. Loaded dipper speeds during swing will reach 25 miles an hour; the boom will accelerate to top speed in eight seconds and decelerate to zero speed in four seconds. Westinghouse drives will be built to maintain this demanding performance continuously, withstand extreme vibration and still develop over 200% of rated loading whenever required. You can be sure...if it's Westinghouse



Main drive d-c motors and M-G sets have exclusive Westinghouse Thermalastic® insulation, exceedingly stable and resilient, to withstand electrical thermal shock variations encountered in shovel service. Tough, low-inertia d-c motor armatures make possible very fast starts, stops and reversals.



World's largest shovel motor-generator sets have these design features—Heavy-duty, self-aligning, spherical seat pedestal sleeve-type main bearings and double-ball end thrust bearings -permitting operation at as much as 10° tilt. Extremely heavy and rigid self-supporting bedplate-insuring that rotating units will stay in correct alignment even under heavy shock stresses and vibration transmitted from shovel structure.



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heig them under control."

For the courtry, the problem is to make tein the Covernment's capacity, in a world of critis, for specify, responsible decisions or was per foreign and demeet a problems, to beld to a

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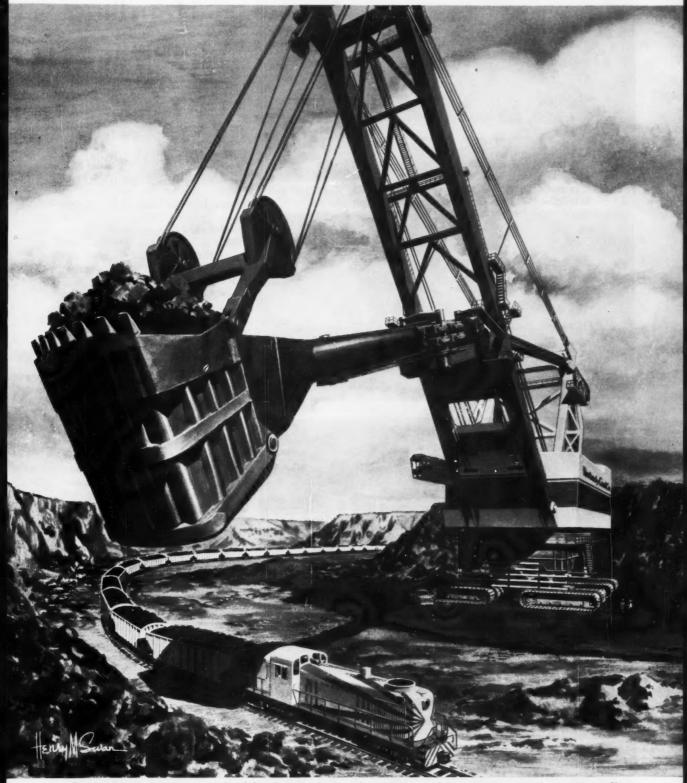
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New Bucyrus-Erie electrically driven strip mining shovel for Peabody Coal Company will weigh 7000 tons, more than Juneau Class Navy cruiser . . . will tower 213 feet high with 450 feet working range. Mammoth 115-cu-yd dipper is 64% larger than any built to date ... will move over 200,000 tons of overburden per day, making possible mining of 4,000,000 tons of coal per year.

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PALLETIZED ROCK DUST is removed from supplier's truck (above) and stored in Delmont Fuel Co.'s supply lean-to (below) pending later use.





ROOF BOLTS in 500-unit bundles are packaged by supplier and moved into and out of storage by the fork-lift which has a capacity of 4 tons.



Handling Mine

Well - designed supply - handling equipment and planned palletizing methods streamline the service functions at underground operations of Delmont Fuel Co.

James L. Tenley, Chief Engineer Delmont Fuel Co. Hunkers, Pa.

OUR MINE No. 10B is in Westmoreland County, in the Upper Freeport seam. The coal height averages 50 in in this area. The roof varies from black slate to sandrock, and the bottom is normally a hard fire clay.

Because of the company's previous experience with conveyor mining it was decided to extract this coal in the so-called conventional or continuous manner but using the Long "Full Dimension" equipment for loading and transportation. To familiarize you with the Long "Full Dimension" equipment in this installation, seven units have been used consisting of a 160-ft chain conveyor line (20 in wide) with a mobile head, three bridge conveyors 40 ft long each, two mobile bridge carriers 28 ft long each and a Long 188-D loading machine. This assembly of equipment makes possible a reach of 189 ft in all directions from the 20-in chain conveyor line. This equipment, in conjunction with 36-in belt conveyors, affords a method of continuous transportation from the face to a 1,500-ton storage bin on the outside of the mine. Two Joy 10-RU cutting machines complete the face equipment.

The projected work for this coal mine shows a five-entry or a fiveroom system, as the case may be, with entries and breakthroughs on 60-ft centers. Advance and retreat moves are made every 120 ft. Entry

Presented at the 1960 meeting of the Coal Mining Institute of America, Pittsburgh, Pa.

Packaged Supplies

and breakthrough cuts are all 20 ft wide advance and 25 ft retreat.

Drilling for 36-in roof bolts is done with stopers, the air for the air tools being supplied by a compressor permanently installed on the surface near the fan shaft. Thin-wall aluminum tubing (5-in diameter) with Victaulic couplings is used to transmit this air in the main entries and 3-in tubing in the rooms. This tubing is in 30-ft lengths so that four lengths must be added per move.

With the decision having been made to use all-belt transportation for coal and to use 550-V AC power supply, the transportation of men and supplies became an immediate problem. Using the 36 in belt conveyor for transporting men and materials was given not much more than a passing glance because of the difficulties many operations have experienced with this type of supply system. The most logical solution seemed to be a track paralleling the main haulage and panel belts using battery-powered locomotives. It was then that a battery locomotive and a battery-powered man trip car, manufactured by National Mine Service Co., were purchased. The track is constructed as mining progresses to



FOUR SUPPLY TRAILERS (above) can be loaded onto a flat car for delivery to the end of the track, then ramped down (below) for face delivery.



within about 300 ft of the coal face.

It was the intention to handle as many of the supplies as possible on pallets and flat cars or in small rubber-tired trailers. The flat cars purchased are 8 in high, 6 ft wide and 20 ft long. The rubber-tired trailers are 4 ft wide, 8 ft long and 17 in high. The flat cars will hold mate-

rials on pallets, or four of the rubbertired trailers can be placed side by side on one of the cars. A batterypowered, rubber-tired tractor, known as an Inspector's Friend, furnished by Long-Airdox, is used to distribute these supplies from the end of the track to the face area.

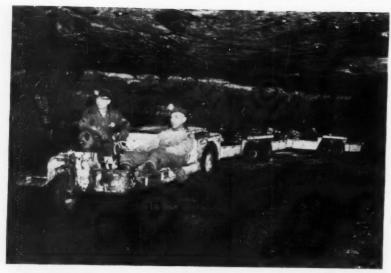
One other piece of equipment was needed to make this supply system



CONCRETE BLOCKS for stopping construction remain on original pallets until they reach the point of use.



FAST TRANSPORTATION for face crews is provided by new battery-powered cars with face and surface charging stations.



FOUR TRAILER LOADS of supplies are sufficient for 40 cuts of coal, each 25 ft wide by 10½ ft deep. Supply train (below) passes under bridge conveyor.





GOOD HOUSEKEEPING marks Delmont Fuel's supply yard. Supply track extends to bulwarked explosives magazine in the distance.

workable, that is, a fork-lift truck with a lifting capacity of 4 tons. A lean-to type building was erected so that the outside inventory of roof bolts and rock dust could be kept out of the weather.

The package handling of some of the supplies must necessarily begin with the suppliers. Through the cooperation of these people the roof bolts, rock dust and concrete blocks are delivered to the mine on pallets. The supply yard storage area and location of the lean-to type building is arranged so as to make these areas easily accessible by truck and fork lift as well as keeping the supplies at a convenient location in relation to the mine supply track. Also, the mine supply track extends to the extreme end of the supply yard area where the powder and cap magazines are located.

The majority of roof bolts used are 36 in long. These bolts are packaged in bundles of 500 and banded to pallets by the suppliers. The supplier has a warehouse 10 mi from the mine so it is not necessary for the mine to carry a large inventory of bolts. Generally a truck will deliver a minimum of 2,000 bolts (4 pallets) which can be unloaded from the truck and placed in the lean-to in about 5 min.

The rock dust is stacked approximately one ton per pallet with a truck load amounting to 15 to 16 tons. This rock dust can be unloaded by the fork lift and placed in the lean-to in from 40 to 45 min.

The oil supply is handled in truck load lots, being unloaded by the fork lift also. Then the barrels are placed on the rack and moved into the oil house as needed. For delivery inside the mine the oil is put into 5-gal G. I. cans. Changes are to be made in the near future that will simplify the oil-handling system.

When roof bolts and rock dust are to be taken into the mine the fork lift picks up the pallets from the lean-to storage building and delivers them to one of the flat cars with the rubber-tired trailers on top as previously described. The supplies are then slid from the pallet into the trailer. If the pallet is not completely emptied it is returned to the lean-to.

The concrete blocks are handled from the supply storage area by the



ONE TRAILER is permanently fitted with the section mechanic's tool box.



ANOTHER carries a welding set, placing a limit on downtime.



A THIRD is the explosives car, all facilitating 120-ft advances.

fork lift, and the pallet, together with the blocks, is placed on the flat car and taken into the mine for use.

Inside the mine the rubber-tired trailers containing the supplies are rolled down a small steel channel ramp to the mine bottom. The battery-powered tractor is then coupled to these loaded trailers and they are delivered to the faces where they are to be used. The trailers that have been emptied are picked up to be returned to the outside for loading. Getting the supplies past the extended "Full Dimension" equipment presents no major problem. In many instances the rubber-tired tractor with the trailers attached can be run under a bridge conveyor. If this is not possible, due to height limitations, then the mining supplies can be crossed during a place change of the "Full Dimension" equipment. Four of these trailers hold enough supplies for 40 cuts of coal 25 ft wide by 101/2 ft deep.

The rubber-tired tractor and trailers have been put to many uses other than the supply system described. This combination makes handling repair parts and other necessary equipment relatively easy. Three of these trailers have found permanent use, one for a 550-V, AC welding machine, another for the mechanic's tool box and another for the powder box and tamping plugs. Having equipment mounted in this manner not only aids in getting around the immediate section but helps a great deal in the regular 120-ft move-up as mining progresses.

After having had approximately 1 yr experience with this type of supply system management feels that with a few minor changes and improvements the system will be very adequate for the needs of this mine. The addition of more coal producing sections will not change the described supply system materially.

Significance of the packaged-supply handling system employed by Delmont Fuel is that it adds to the efficiency of mechanized mining. Where "Full Dimension" mining provides continuous loading and hauling of coal, package supply handling eases the job of moving needed material into the mine to keep the system operating continuously. Transportation and storage of supplies is simplified and handling is held to a minimum.

Exclusive in Coal Age



See the first page (124) of New Equipment News in this issue for a full description of this new dual-head auger for thin coal—exclusively in *Coal Age*.

In the New Equipment News this month you also will find 27 other products hot off the griddle in line with Coal Age's aim of bringing you the most the quickest. This aim was reflected in the publication of 339 new-product features in Coal Age in 1960.

COMING IN APRIL

A special 32-page-plus section featuring the new and major products to be exhibited at the American Mining Congress Coal Show.

The Changing Nature of Maintenance

PROBABLY no one phase of mining underwent more change than did maintenance in the past 10 yr. What has caused this change? How has it affected you?

Figures show that mechanicallyloaded underground production increased from 69.3% in 1950 to 87.7% in 1960. The number of continuous miners in use at the end of 1960 was 890 compared with 152 in 1952 (earliest figures).

Coal preparation is another phase of mining that has grown rapidly. Percentage of coal mechanically cleaned increased from 35.8% in 1950 to 67.8% in 1960.

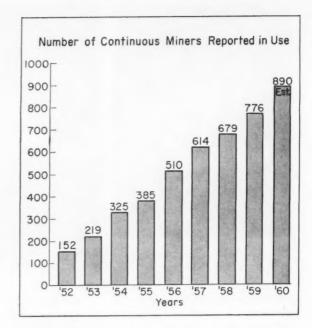
The all-AC mine has become the rule rather than the exception. It is safe to assume that 60% of all new mines within the past 2 yr have been equipped with AC. Ten years ago this figure probably would have been 100% DC. Many of the older mines also are converting to AC.

In the next 10 mining years there will be increases in the number and size of machines going underground. Preparation plants also will increase in size and many more will be constructed. This will require more electricity to produce a ton of coal. The present figure is from 10 to 12 kwhr per ton. The 1970 figure probably will be from 20 to 25 kwhr per ton.

Maintenance then has changed in the past 10 yr because:

- 1. Mechanical loading increased substantially, percentage wise.
- 2. Mechanical cleaning increased by a factor of 2, almost.
- 3. AC power underground advanced from the exception to the rule.
- 4. Power consumption, kwhr per ton of coal produced, increased.
- 5. Equipment designs changed rapidly.

Maintenance as a result is and will



continue to be one of management's most pressing problems. At present it is the third largest cost factor in mine operation. Maintenance cost is estimated to be approximately 40¢ per ton. With a 415-million-ton year (1960) the industry spent \$16.6 million or more on maintenance alone.

Maintenance cost per ton is not expected to decrease. It may remain fairly constant but it probably will

Where maintenance organizations once were considered necessary but not important, they now have assumed a more active role-performing

Essential Electrical

PRACTICAL CALCULATIONS are necessary in the daily routine of design, layout, maintenance and other problems associated with electrical systems for mining operations. The following formulas have been classified according to types of power (AC or DC) and circuits most commonly encountered. The National Electric Code is used to clarify ampere loads for feeder or main, and branch circuits.

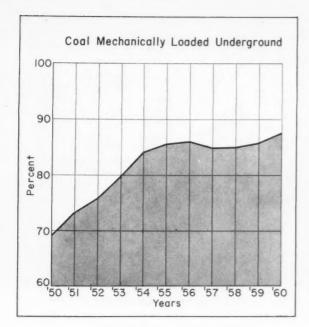
DC CIRCUIT CHARACTERISTICS

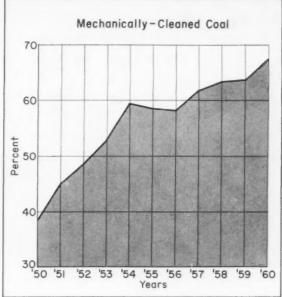
Ohm's Law:

$$E = IR; I = \frac{E}{R}; R = \frac{E}{I}$$

In DC circuits, electrical power is equal to the product of the voltage and current:

$$P = EI = I^{2}R = \frac{E^{2}}{R} \qquad \qquad E$$





on a level equivalent to production.

Success or failure in maintenance is a measure of success or failure of an operation. An efficient maintenance organization can reduce operating costs as much as 10 to 25%. A company using continuous miners, for example, can lose from 3 to 8 tons of

coal for each minute of machine down-time.

Maintenance organization in the future will require "maintenance engineering" to cope with added responsibilities and new techniques. Automation and electronics are coming into their own in the mining field.

These new fields of technology give insight into the future of maintenance and highlight the need for more engineering ability. If the industry starts planning for these technological advances now it will not be caught shorthanded again for good maintenance personnel.

Design and Layout Data

AC CIRCUIT CHARACTERISTICS

The instantaneous values of an alternating current or voltage vary from zero to a maximum value each half cycle. In the practical formulas which follow, the "effective value" of current and voltage is used and defined as follows:

Effective value $= 0.707 \times \text{maximum instantaneous}$ value

Impedance:

Impedance is the total opposition to the flow of AC. It is a function of resistance, capacitive reactance and inductive reactance. The following formulas relate these circuit properties:

$$X_L = 2\pi f L; X_0 = \frac{1}{2\pi f C}; Z = \sqrt{R^2 + (X_L - X_0)^2}$$

X_{I.} = inductive reactance (ohms)

X_c = capacitive reactance (ohms)

Z = impedance (ohms)

f = frequency (cycles per second)

C = capacitance (farads)

L = inductance (henrys)

R = resistance (ohms)

r = 3.14

Ohm's Law for AC Circuits:

$$E = IZ; I = \frac{E}{Z}; Z = \frac{E}{I}$$

Power Factor

Power factor of a circuit or system is the ratio of actual power (watts) to apparent power (volt-amperes), and is equal to the cosine of the phase angle of the circuit:

$$PF = \frac{\text{actual power}}{\text{apparent power}} = \frac{\text{watts}}{\text{volts} \times \text{amperes}} = \frac{\text{KW}}{\text{KVA}} = \frac{\text{R}}{\text{Z}}$$

KW = kilowatts

KVA = kilovolt-amperes = volt-amperes × 1,000

PF = power factor (expressed as decimal)

Single-Phase Circuits

$$KVA = \frac{EI}{1,000} = \frac{KW}{PF}$$
; $KW = KVA \times PF$

$$I = \frac{P}{E \times PF}; E = \frac{P}{I \times PF}; PF = \frac{P}{E \times I}$$

$$P = E \times I \times PF$$

(Continued on p 100)

Maintenance Ideas

Three-Phase Circuits, Balanced Star or Wye

$$I_N = O; I = I_P; E = \sqrt{3} E_P = 1.73 E_P$$

$$E_{\Gamma} = \frac{E}{\sqrt{3}} = \frac{E}{1.73} = 0.577E$$

I_N = current in neutral (amperes)

I = line current per phase (amperes)

I_P = current in each phase winding (amperes)

E = voltage, phase-to-phase (volts)

E_P = voltage, phase-to-neutral (volts)

Three-Phase Circuits, Balanced Delta

1 = 1.732 × I_P; I_P =
$$\frac{1}{\sqrt{3}}$$
 = 0.577 × I

$$E = E_{\rm F}$$

Power: Balanced 3-Wire, 3-Phase Circuits, Delta or Wye For unity power factor (PF = 1.0):

$$P = 1.732 \times E \times I$$

I =
$$\frac{P}{\sqrt{3}E} = \frac{0.577P}{E}$$
; E = $\frac{P}{\sqrt{3} \times I} = \frac{0.577P}{I}$

P = total power (watts)

For any load:

$$P = 1.732 \times E \times I \times PF; VA = 1.732 \times E \times I$$

E =
$$\frac{P}{PF \times 1.732 \times I} = \frac{0.577 \times P}{PF \times I}$$

$$1 = \frac{P}{PF \times 1.732 \times E} = \frac{0.577 \times P}{PF \times E}$$

$$PF = \frac{P}{1.732 \times 1 \times E} = \frac{0.577 \times P}{1 \times E}$$

VA = apparent power (volt-amperes)

P = actual power (watts)

E = line voltage, phase-to-phase (volts)

I = line current (amperes)

Power Loss: Any AC or DC Circuit

$$P = I^{2}R; I = \sqrt{\frac{P}{R}}; R = \frac{P}{I^{2}}$$

P = power heat loss in circuit (watts)

I = effective current in conductor (amperes)

R = conductor resistance (ohms)

FEEDERS OR MAINS

Two-Wire DC or Single-Phase AC:

Ampere load is equal to the sum of all branch-circuit ampere loads supplied by the conductor, adjusted by demand factors in accordance with Sec. 2203 of the National Electrical Code.

Three-Wire DC or Single-Phase AC:

Ampere load on either outside wire is equal to the sum of all branch-circuit ampere loads supplied by the conductor, adjusted by demand factors in accordance with Sec. 2203, NEC.

Ampere load on the neutral is equal to the ampere load on the more heavily loaded outside wire when that current is 200 amp or less. If the load on either of the outside wires is more than 200 amp, the current in the neutral may be taken as 200 plus 70% of the current in excess of 200 amp.

Four-Wire, Three-Phase:

Ampere load on any phase conductor is equal to sum of all branch-circuit ampere loads supplied by the conductor, adjusted by demand factor in accordance with Sec. 2203, NEC.

Ampere load on the neutral is equal to the ampere load on the most heavily loaded phase conductor when that current is 200 amp or less. Over 200 amp, load on neutral can be taken as 200 plus 70% of the current in excess of 200 amp.

Neutral Feeder Load (Sec. 2203g, NEC):

The load on a feeder-neutral conductor shall be taken as the maximum unbalance of the load on the feeder. The maximum unbalance of the load is the maximum connected load between the neutral and any one ungrounded conductor. For 3-wire DC, single-phase AC, or 4-wire, 3-phase AC, demand factor of 70% may be applied to unbalanced load in excess of 200 amp.

Feeder Carrying Capacity

I =
$$\frac{\text{load watts}}{\text{K} \times \text{E} \times \text{PF}} = \frac{\text{load volt-amperes}}{\text{K} \times \text{E}}$$

K = 1 for 2-wire DC or single-phase AC

= 1.732 for 3-wire, 3-phase AC

= 2 for 3-wire DC or single-phase AC

= 3 for 4-wire, 3-phase AC

 E = voltage between outside wire and neutra or, if no neutral exist, between any two line wires (volts)

> current in any line wire except neutral (amperes),
> which feeder must be rated to carry (check tables of conductor current ratings)

Branch Circuits . . .

Two-Wire:

total connected load (watts)

line voltage (volts)

I = current load on conductor (amperes)

Three-Wire

Apply same formula as for two-wire branch circuit, considering each line to neutral separately. Use line-to-neutral voltage; result gives current in line conductors.

The Case for Greases With Inorganic Thickeners

POINTING OUT that certain statements in the article entitled "Bearing Maintenance: Lubrication" (Coal Age, November, 1960, pp 94-96) are not in accord with the findings and experience of his company, D. H. Michael, general manager, Hulburt Oil & Grease Co., offers these comments and observations:

"This article should be read by all maintenance men in the mining industry and they should note, in particular, the first paragraph showing that \$13,000,000 is spent per

(Continued on p 104)



Orient Mine No. 5 near West Frankfort, III., Freeman Coal Mining Corporation, Subsidiary of Material Service Division, General Dynamics Corp.

Freeman Coal looks forward to years of efficient, low cost preparation!

Keeping ahead of competition, now and in the years ahead, was of utmost importance to the management of the Freeman Coal Mining Corporation when they commissioned McNally Pittsburg to design and build their new preparation plant.

This new plant receives run-of-mine bituminous coal at 750 tph, which goes to a rotary breaker for sizing to $3\frac{1}{2}$ " x 0, thence to a storage bin—and then at 700 tph goes to the plant for sizing and cleaning.

The dense media baths then handle the $3\frac{1}{2}$ " x 1" and 1" x $\frac{1}{4}$ " sizes—with $\frac{1}{4}$ " x 0 delivered to separate

fine coal cleaning equipment. The washed $\frac{1}{4}$ " x 0 is dewatered on vibrating screens and goes to the centrifugal dryers.

Thermal dryers then remove excess moisture from two sizes— $\frac{1}{4}$ " x 10 mesh and 10 mesh x 0. The 2" x $\frac{1}{2}$ ", 1 $\frac{1}{2}$ " x 1", 1" x $\frac{1}{4}$ ", $\frac{1}{4}$ " x 10 M, 10 M x 48 M, and 48 M x 0 are delivered to tracks for loading out.

Ask the "Man from McNally" for complete details on the coal preparation equipment of your choice. His knowledge and experience of preparation problems have helped many produce more—more profitably.

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Please send me information about the following equipment:

- ☐ Complete Coal Preparation Plants ☐ Conveyors
- ☐ Automatic Sampling ☐ Coal Cleaning
- ☐ Crushers and Breakers ☐ Thermal Dryers
- Coal Preparation Manual Centrifugal Dryers

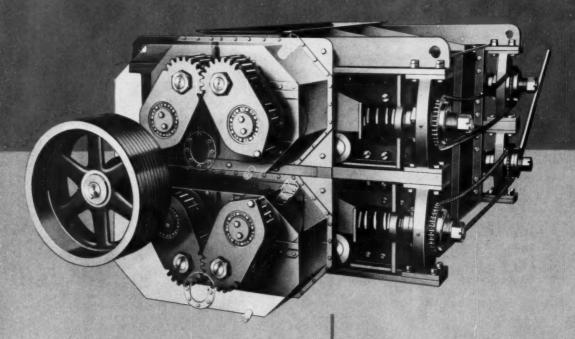
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Major mines get practically no oversize with this crusher



This new, two-stage, four-roll Gearmatic Crusher takes coal up to 8" in size and reduces it to a minimum 1" x 0 product. And it has been doing it in major mines across the country with practically no oversize and a minimum of $\frac{1}{4}$ " minus in the crushed product. Available in 36", 48", or 60" widths with capacities from 150 tons to 350 tons per hour. Write today for full details.

NEW McNALLY TWO-STAGE GEARMATIC CRUSHER

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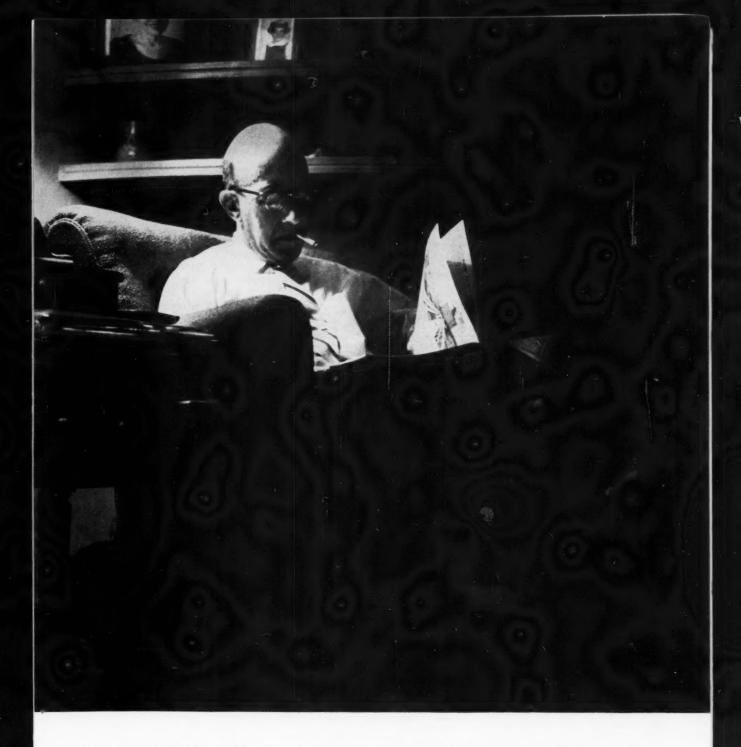
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Reading COAL AGE is a favorite pastime for thousands of alert mine officials who want to do a better job for their company, and themselves. These men count on COAL AGE to keep them informed and ahead of the industry. Speaking from experience, subscribers vote 6½-to-1 for COAL AGE over any other magazine they read for business,

STEARNS INDOX V Magnetic Separators Make Believers Out of Customers...Competitors, Too

Amazing new permanent magnet material provides important efficiency improvements at lower cost in coal cleaning applications.

Before 1958, users of magnetic separation equipment had no choice but to buy electromagnetic units when the job required a deep and powerful field. Then from Stearns came INDOX V—a permanent magnet material which not only provided the field strengths needed but permitted separator designs that were less costly to install, maintain and operate. Further, INDOX V-equipped wet drum separators and permanent magnetic head pulleys are not subject to the costly, time-robbing breakdowns encountered with electros as a result of insulation failure due to moisture.

INDOX V Opens New Design Era

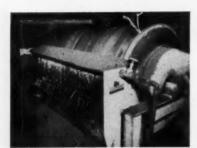
But what is INDOX V? It is a highly oriented barium ferrite ceramic magnet material developed by Indiana Steel Products, Division of Indiana General. INDOX V possesses unique advantages for separator design—lightweight, high electrical resistivity, great resistance to demagnetization (stable to -40° C), and high magnetomotive force per unit of length. Made of low-cost, non-critical raw materials, INDOX V supplies an energy product, on an equivalent weight basis, equal to ALNICO V and three times greater than that of ordinary un-oriented ceramic magnet material.

Design Experience Pays Off — For You

Because of the increased design flexibility and other advantages offered by INDOX V, Stearns engineers were able to achieve dramatic improvements in separator efficiency with the added bonus of low cost.

For example, with the advent of INDOX V it became both practical and economical to employ permanent magnet radial pulleys on heavily loaded conveyors requiring diameters up to 48" — jobs that previously required expensive electro units.

Stearns pioneered the development of the first permanent magnet wet drum



Index V-equipped wet drum separator provides unequalled magnetic media recovery in large coal-processing plant — delivers up to 70% solids content.

separators for heavy media applications, using Alnico V. Then, recognizing the design and cost benefits to be gained with Indox V, we again pioneered the industry switch to these even more efficient, less costly ceramicequipped units. Today, Stearns, with a large number of job-proved installations, is the recognized leader in this type of HMS equipment. The recent widespread change-over to ceramic permanent magnets in the magnetic separation equipment industry gives further proof of the success of Indox V in these applications.

Broadest Equipment Line

Stearns offers a complete line of jobproved INDOX V-equipped wet drums, pulleys and complete pulley separator units to handle any coal cleaning application — from removal of tramp metal to recovery of magnetic media. And, for those jobs that require frequent variation of field strength, we continue to offer electro separators, including a brand new line of suspended magnets, employing the latest in both electrical and mechanical design.

To take advantage of this unmatched experience, call in a Stearns engineer today for a job-studied recommendation and price quotation. Literature sent on letterhead request.

Case for Greases

(Continued from p 100)

year by the mining industry for bearing replacement alone. The article infers, and I concur, that a proper lubrication program and the use of proper lubricants would greatly reduce this very high cost to the mining industry.

"I have one criticism. On p 95 the article includes the following: 'Inorganic thickeners, such as, clay and silica-gel types, are being developed as substitutes for soap types. These greases have non-melting properties and are resistant to water. However, they do not qualify as a rust preventive. In addition, they create high bearing torque and do not feed adequately to sliding points.'

"We at Hulburt cannot agree with this particular paragraph, even though the gist of it has appeared in a number of books and treatises on lubrication. First, it is erroneous to infer that inorganic thickeners are only now being developed as substitutes for soap types. Hulburt Oil & Grease Co. has marketed a fully developed and proven lubricant of this nature since 1951. Our AP greases are of the inorganicthickener type and today are probably the most-popular and widely accepted brand of grease in the mining industry. Therefore, as far as mining is concerned. I do not think it can be said that these greases are only in the development stage.

"The statement that they do not qualify as rust preventive is not necessarily true and could be quite misleading. Inorganic-thickened greases by themselves do not provide rust prevention, but a properly compounded inorganic grease, such as marketed by Hulburt, has built into it the very finest of rust prevention—achieved by a complex blend of rust-preventive additives.

"Finally, the article states that such greases create high bearing torque and do not feed adequately to sliding points. Here again it has been proved that certain properly formulated and compounded greases using inorganic thickeners can result in even lower bearing torque and feed more adequately to sliding points. For example, Hulburt 8 AP CT has shown markedly lower torque, better feed and longer life in mine-car wheel bearings."



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BOSTON FLAMEOUT 200* — Single-ply, flame resistant belt with maximum impact resistance, outstanding edge wear, and fastener holding strength. Has neoprene covers. No slipping on pulley. Improved wear-resistant cover available in any thickness. Ideal for panel and continuous miner installations.

BOSTON COLLIERY KING — Balanced Belt Construction with Dulon covers for longest service life in preparation plants and all above-ground coal handling.

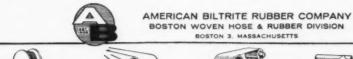
BELTING

BOSTON SUPER BOSTRON — Balanced Belt Construction, with Dulon or Flameout covers for severe impact and high tension belts. Ideal construction for longest service life on slope conveyors. Strong, thin carcass allows smallest diameter rolls for low coal removal. Carcass will not rot or mildew.

BOSTON FLAMEOUT* — Balanced Belt Construction for permanent underground installations and main entries having special tension requirements.

*Fire-resistant — maximum underground safety. Meets standards of U. S. Bureau of Mines Acceptance Designation No. 28-9.

Whatever your requirement, BOSTON has the right belt for the job — assuring you longer belt life...less trouble in service...greater economy!



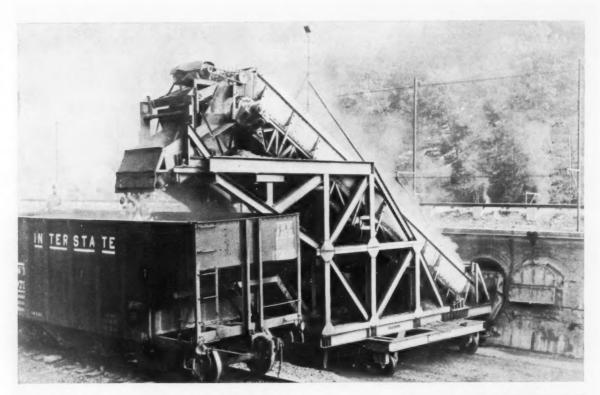








INDUSTRIAL HOSE



Coke Production Goes Back to the Mines

Discharge side of a bank of modern horizontal slot-type coke ovens. These and other modern designs are sparking a rebirth in coking at the mines.

The number of horizontal slot-type coke ovens installed in the U. S. in 1960 exceeded the total number of vertical slot-type by-product units placed in that same year.

All horizontal slot-type coke ovens were installed by coal-mining companies. While those built in 1960 were of the nonrecovery type, some horizontal slot-type installations planned for 1961 incorporate semi-by-product recovery equipment (gas, tar and light oil), with two main objectives: (1) recovery of the basic by-products and (2) smoke abatement (in urban areas).

How They Work

In this modern slot-type oven installation the crusher-conveyor is receiving coke from the discharge side of one of the ovens. A coke pusher (not shown) on the far side of the oven is pushing the coke through. The pusher may be operated manually from its own cab or remotely (by radio controls) from the conveyor cab. With the remotecontrol equipment the conveyor operator can operate the conveyor, the pusher on the opposite side, the locomotive pulling the train of cars beneath the conveyor-discharge chute and, in some installations, sprayquenching equipment on the conveyor itself. Crushing spikes at the top of the conveyor reduce coke to the desired chunk size.

The New Look in Coking

John B. Shallenberger

President, Connellsville Corporation Connellsville, Pa.

WHEN BY-PRODUCT COKE OVENS were the talk of industry early in this century, they spelled revolutionary progress for those who installed them. The by-products were a kind of liquid gold, whose value was seen to soar beyond their producers' fondest hopes. These by-products themselves came to pay the entire cost of operating the ovens. Coke itself lost the limelight to ammonium sulphate, benzene, toluene, xylene, naphthalene, phenol and many other prizes of the chemical world. One felt at times that coke was the by-product, the oven having become a cornucopia of riches in many other forms.

Sound in Their Time

By-product coke ovens had other advantages. They were tall and narrow and needed less space than the old beehives, and the coke gases were worked so hard in various stages subsequent to coking itself that they were mostly consumed before reaching the atmosphere. They could be operated in urban areas without heavy air pollution.

But by-product coke ovens were costly-to build and especially to operate. The capital investment and labor force needed were often in excess of what coal mines could afford. Coke operations therefore moved to a large extent out of the hands of coal operators into the hands of rich and venturesome steel producers. That made good sense in a number of ways. For one, and this bears noting regardless of other factors, coal could be shipped about as cheaply as coke from mine to steel mill. Even though it had not been stripped of its volatiles and impurities, coal was less bulky and space consuming than coke in shipment. It took about three lightly loaded freight cars to ship the same amount of carbon in the form of coke compared to two heavier carloads in the form of coal equivalent. Even today, engineers and economists can find little to choose between relative shipping costs of coal and coke.

By-product coke ovens were the expression of sound economics, and those who installed them exercised wisdom in their selection.

Since the fruits of coal-chemical revenues were beyond the reach of many coal-mining companies, which were not blessed with the kind of cash required to put up and operate by-product oven facilities, many such companies with steel-mill markets began pulling in their horns and discontinuing coking operations during the 20s. Many even dropped the word "coke" from their names to become just coal companies. Their old beehive ovens became less and less active. Red skies dimmed to darkness over parts of western Pennsylvania, West Virginia, Virginia, Kentucky and elsewhere.

Competition Sparks the Change

Red skies are not reappearing widely, but coal mines today are finding new sources of profits by reentering or expanding coke production using modern low-labor coke-oven equipment. Widespread change is imminent, largely because of completely external factors. The rich glitter of by-products has begun to fade—not because by-product ovens have not been efficient, not because steel companies failed to operate them to their maximum potential, and not



John B. Shallenberger

Mr. Shallenberger has for 15 yr served as president of the Connellsville Corp., designers and manufacturers of cokehandling devices for various types of coke ovens, including both by-product and semi-by-product units, as well as horizontal slot-type, beehive and other types. Known from its foundation in 1901 until recently as the Connellsville Mfg. & Mine Supply Co., the Connellsville Corp. produces a wide range of coal-mining equipment, including bottom-discharging skips, self-dumping cages, rotary car dumpers, car feeders, car hauls, car feeder- retarders, car spotters, hoists, portable elevators and other handling equipment.

Mr. Shallenberger has been called "the world's most-travelled industrialist," having toured the world many times and visited 109 different countries on business. An 88-country research trip made by him under Ford Foundation sponsorship resulted in the recently published Shallenberger Report, an appraisal of company managers in the Free World. Mr. Shallenberger was graduated with Tau Beta Pi honors from Stanford University in mechanical engineering, and holds a master's degree in industrial management from the Harvard Graduate School of Business Administration.

because anything happened to the quality of the raw materials.

Competition was the villian—competition in the form of petrochemicals, which appeared on the scene concurrently with rapidly accelerated oil production. Petrochemicals had a natural advantage over the same chemicals produced from coal. Coal had first, in a sense, to be made into liquid, then converted to the desired chemical

forms. Oil was already a liquid. It was halfway there as it came from the ground. Chemicals made from oil were, for this and other reasons, less costly than coal chemicals. Coal byproducts, in country after country, no longer could bring home a price sufficient to meet their high labor-cost and capital-investment contents.

Only naphthalene has remained, among the valuable coal chemicals, in the coke producers' competitive domain; petrochemicals have not succeeded in upsetting the market for that coke by-product. (Yet, researchers are already claiming a naphthalene-substitute break-through, and their claims suggest that naphthalene too will be a lost market for the coke industry.)

Excess gas from by-product coke ovens retains value as locally available fuel. Some steel companies, including some which have abandoned normal by-product recovery, are now ducting coke-down gases directly to the blast furnaces to provide additional heat and some additional fuel.

Considering the dwindling markets for coal chemicals and the high capital cost and extremely high operatinglabor cost of by-product coke ovens, coal chemicals face an uncertain future. The eventual emergence of petrochemicals as a worldwide competitive winner is clear, but that is not to say that petrochemicals will be the only finalist. Market demand itself is expanding, and demand enough for all, both petrochemicals and coal chemicals, is visible in at least the distant future. A look at world reserves would suggest, also for the distant future, earlier depletion of petroleum resources than coal.

When and if coal outlives petroleum, coal by-products will of course come back into their own. For the time being, by-product oven operators are taking a new look at the economics which were so clearly in their favor when they started out. Some of them are slowing the pace of coke-oven expansion. Very few, if any, are risking the capital cost of new by-product coke yards. Many are studying the possibility of operating their existing by-product ovens on a nonrecovery basis. Some are already doing so.

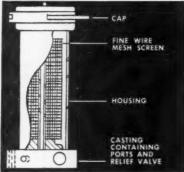
Meaning for Coal

The portent of all this to the coal industry today has nothing to do, it

FIRE-RESISTANT Hydraulic fluid

Demands A WELL-FED CLEAN PUMP

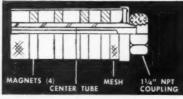
Schroeder Micronic Line Filters Handle The Cleaning Job



Equipped with fine wire mesh* and internally relieved, the Line Filter is placed in the pressure or return side of the system. The micronic filter element traps the dirt load carried in suspension by the invert emulsion, otherwise the dirt will flow unimpeded thru the system again and again. As the fluid is forced thru the fine mesh, its stability and viscosity characteristics improve. This "shear" minimizes suction line trouble and stratification.

*Interchangeable with "K" & "F" paper elements which are not recommended for invert emulsions.

Schroeder Strainers Prevent Starvation of the Pump



The suction line to the pump is a super-highway if provided with Type SKB Magnetic Suction Strainers. Equipped with a large mesh outer cover surrounding 4 strong magnets, this rugged Strainer removes the larger foreign particles and magnetic material of micronic size from the fluid as it flows to the pump.

A Schroeder SpinDicatos, used in parallel with the Line Filter indicates when the wire mesh element in the Filter must be cleaned. A red spinner is used for better visibility in the white fluid.

Write for additional information and data.

SCHROEDER BROTHERS

McKEES ROCKS (Pgh. Dist.), PA.

seems, with the overall demand and consumption of coal. But it will greatly affect the integration and breadth of coal-mining-company operations. Economists have called the earlier absorption by the steel companies of a raw material source-the installation of their own coke-producing facilitiesbackward integration (reaching backward to absorb their supply sources). Coal companies seem now destined to return to coking, and thus to a job now done in many cases by their customers (absorption by the raw-material supplier of the next successive stage in the economic process). This new venture by coal companies the economists will call forward integra-

What form will this forward integration take? What facilities will the coal companies install, and what commercial commitments will they undertake?

Facilities are expensive, and if coal companies are going to enter an additional business, or to absorb an additional stage in the process through expansion again into industries other than coal mining, they will want to be assured of markets for their new venture.

The most likely commercial development, already demonstrated in some countries, is the spread of longrange coke-supply contracts. Just as one coal and coke company (one, incidentally, which never dropped "coke" from its name) has recently contracted to supply coke for 10 yr to a distant steel company, and just as a coal company has recently entered an agreement to supply coke for 10 yr to a neighboring chemical plant, and just as another coal company is contracting to supply coke for 15 yr to another somewhat distant steel mill, many others are being approached by coke users, or are out selling and offering contracts for long-term coke supply.

It is too early to cite examples of steel companies closing down their own coke ovens and buying all their coke from others. But several, I am told, are thinking long and hard about this possibility, and a number are actively negotiating with coal-mining companies, as are some chemical companies and foundries, for long-term coke supplies on contract.

With prospects of growing and continuing demand, many coal mining companies will quickly, some by late 1961, reenter the coking industry which they abandoned in years gone by.

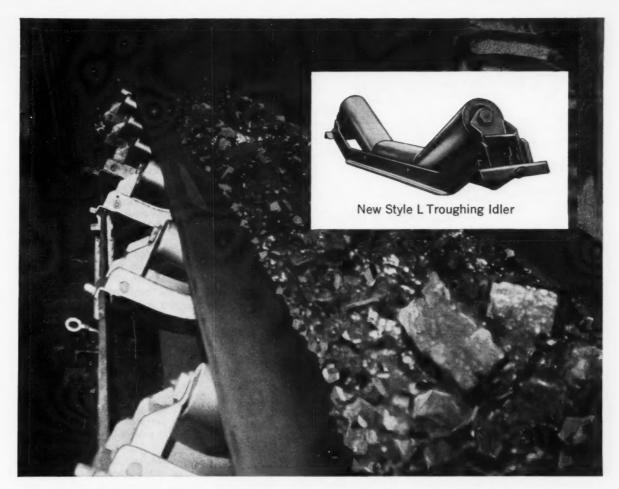
The New Coking Facilities

One can only surmise the direction which will be taken by coke-producing companies in their facilities selection. Some will see such explosive markets for chemicals that they will not hesitate to expand existing by-product coke-oven plants, either with full-scale completely integrated facilities like the magnificent cake installations owned by steel companies and others today, or less elaborate "semi-by-product" facilities designed for recovery of tar, gas and light oils only.

Others will forego all hope of byproduct markets and install nonrecovery ovens. Some of the nonrecovery oven operators will go back to the old beehive ovens—the cheapest to buy and the quickest to put into operation. Others will worry about the high labor cost of operating beehives, and will choose horizontal slot-type ovens which lend themselves to easy mechanization. Some coke operators will see advantages in the rotary coke oven.

The most popular among these alternatives, according to present indications, will be the horizontal slottype oven, sometimes with auxiliary equipment to catch the smoke and recover gas, tar and light oils for sale in unrefined form. Even including this recovery equipment, the cost of horizontal slot-type equipment is lower than for vertical slot-type ovens, and the number of men required to operate them, compared to by-product coking facilities of the same capacity, is but a fraction.

The trend toward long-term cokesupply contracts and the accelerated return of coking operations to the coalmining companies are clearly in evidence. It will be interesting to observe the forms in which these phenomena manifest themselves. Those of us charged with manufacturing equipment for the coke yards, whether for by-product or semi-byproduct or nonrecovery coke ovens, are enjoying the opportunity to furnish them again to the coal-mine market. We shall do our best to provide quality machines at low prices and on quick delivery schedules, trying as always to bring to coal-mining companies optimum equipment based on latest technological progress.



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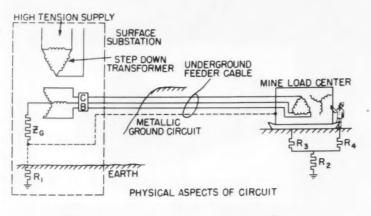
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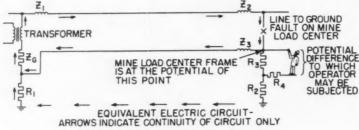


FIG. 1 - FACTORS involved in shock hazards.

The various impedances involved in this system, and their time designations, are identified in the following table:

- Z₁—Effective impedance of the supply system, including step-down transformer
- Z₂—Effective impedance of the phase conductors in the underground primary feeder cables
- Z₃—Effective impedance of the ground return conductor in the underground primary feeder
- Z_E-Effective impedance of the ground current limiting device at the substation
- R₁—Grounding resistance at the substation
- R2—Effective earth resistance between the junction of R2 and R3 to mean earth potential R3—Effective contact resistance between the mine
- R3-Effective contact resistance between the mine load center and the immediate surrounding earth
- R₄—Effective contact resistance between a man and the earth on which he stands

Mine Power Systems

What's your grounding-practice IQ?

D. E. Hamilton, Electrical Engineer, General Electric Co. Schenectady, N. Y.

ALTHOUGH you may have a good working knowledge of grounding practices, a short review may prevent a costly mistake. Citing two examples of what can happen will illustrate the necessity for a review of knowledge and practice:

An operator was showing a portable switchhouse which he was having built. Entrance bushings were used to completely insulate the ground conductor as it passed into, through and out of the enclosure. It was not realized that a phase-to-enclosure fault inside the switchhouse could have electrocuted anyone touching

the structure while standing on grade.

Another operator had a customdesigned portable substation built as shown in Fig. 8. Note the transformer, grounding resistor and switchhouse on a common skid. The transformer was to be supplied from a 33-kv system. In an effort to maintain isolation between the station ground and the protective ground the operator had insulated the cable coupler from the other metal parts and enclosures on the skid. The error in this arrangement would expose a person touching both the coupler and switchhouse to a lethal shock if a primary lightning arrester spilled over, or a ground fault occurred within any of the equipment on the skid.

Practices for the protective grounding of mining machinery were developed for and adopted by openpit mines over 25 yr ago. Underground AC mines have the same problems. This review covers the features of protective grounding and the precautions to be observed in the installation and use of the system in both open pits and underground.

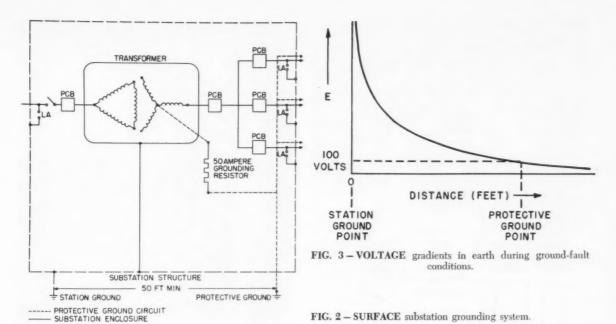
The Cause of Ground Faults

If an electrical conductor in a grounded system contacts the frame of a machine, or any metal part connected to the frame, a groundfault current will flow from the frame to earth. This current causes a voltage difference between the frame and ground due to the contact resistance between the two. In the case of a portable machine this electrical connection is generally a poor one and, hence, a dangerous voltage can be developed when groundfault current is flowing. The voltage -equal approximately to the product of ground current and the frameto-ground resistance-produces a definite shock hazard to personnel.

The potential to which a human might be subjected with lethal effect is variable. However, extensive electromedical tests have been conducted to define this important parameter. The mining industry has standardized on a maximum value of 100-V frame-to-ground potential. This value, adopted over 25 yr ago by the developers of protectivegrounding systems for strip mines, is actually less than the value of 150 V suggested by AIEE WG 56.1 in its report entitled "Voltage Gradients Through the Ground Under Fault Conditions" (Trans. Paper No. 58-98). The value given in this report was for a shock of limited time duration. One important point to note is that the lethal effect of a shock is an It relationship where I equals current and t equals time. Therefore, it is necessary to design a system which limits the potential to which a person is exposed and automatically de-energizes the faulted circuit.

Severity of Shock Hazards

The relative importance of various factors which affect the shock-hazard problem are shown in Fig. 1, the physical layout in Fig. 1A and the equivalent electrical diagram in Fig. 1B. The two most important are:



- 1. Magnitude of ground-fault current.
- 2. Resistance from machine frame to ground (R₃).

The ground-fault current is determined by the power-supply voltage acting on the fault-circuit impedance. The normal power-system impedance -substation-transformer and transmission-cable impedances (Z1 and Z2) -are of necessity relatively low for proper performance of power equipment. The fault current might be thousands of amperes if it were limited only by these impedances. A protective system designed to handle such large ground currents would require an extensive and costly low-resistance grounding circuit for the portable machine. However, a lower value of ground current can be secured with no sacrifice in power-machinery performance by introducing the neutral-grounding impedance (Z_G) .

The mine-load-center frame-to-ground resistance—direct contact of support with earth—is very indefinite. Even under favorable circumstances the ground resistance will not be low. It may be 100 ohms or more in mine entries. Even a group of driven ground rods at the mine-load center may have a ground resistance of 10 ohms or more unless the installation is carefully made and maintained. A 10-ohm ground resistance and a ground-fault current of 100 amp

would produce a shock-hazard potential of 1,000 V between the machine and ground.

Ground-fault current can be limited to as low as 25 amp in most cases without causing undue relaying problems. The ground-circuit resistance should be such that the IR drop (voltage) due to the ground-fault current does not exceed 100 V. For example, for a 25-amp-fault level the resistance should not exceed 4 ohms, or for a 50-amp-fault level the resistance should not exceed 2 ohms. A reliable ground-circuit resistance of such desired values requires ground-return conductor from the frame of the portable machine back to the supply substation, as represented by impedance in Z3 in Fig. 1B. This ground-return circuit alone is designed to come within the desired limit since other ground paths are so variable. This practice assures adequate safety even if the resistance of other ground paths is very high.

It is important to recognize one point in determining the maximum level of ground current during fault conditions. The objective is not to limit ground current as such in consideration of shock hazard, but rather to limit the potential rise above ground that appears on the frames and enclosures of the equipment connected to the power system.

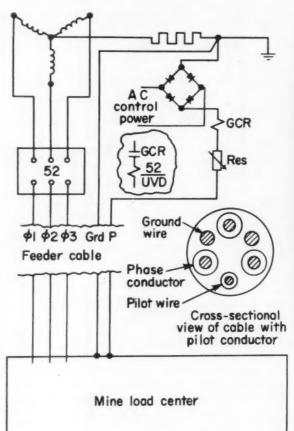
Any combination of ground-current and ground-return resistance which gives a resultant maximum potential rise of 100 V meets the intent

of the aforementioned resistancegrounding system. Thus, a system having a ground-fault current of 200 amp maximum flowing through a ground-return-path resistance of 0.5 ohms is just as safe from the shockhazard standpoint as a system having 50-amp maximum ground current flowing through a ground-return-path resistance of 2 ohms. Since a maximum of 2 ohms in the ground-return path is easily obtained by the use of modern mine-power cables with ground wires in the interstices, the use of 50-amp neutral-grounding resistors has received wide acceptance by mine operators.

Surface Substation Grounding

An important point concerning the design of the main substation should be mentioned (see Fig. 2). The ground-fault current which may be supplied by the high-voltage system is not controlled by the local electric-system design and may often be quite large. Any line-to-ground flashover at the main substation will allow the high-voltage-system ground current to flow into the main substation ground. This current would persist for a time interval governed by the switching time of the high-voltage protective circuit breaker.

A 5,000-amp ground-fault current (which might easily be equalled or exceeded) in combination with the main substation ground resistance of 2 ohms (considered a good station



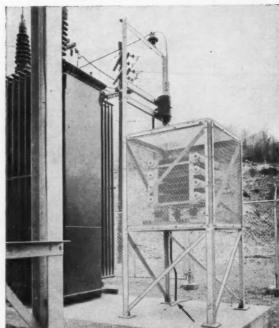


FIG. 5 – GROUNDING ERROR-keep protective ground isolated from station ground.

FIG. 4 - GROUND-CONTINUITY check circuit.

ground) would cause the entire main substation structure to be elevated 10,000 V with respect to ground, and remain at this potential until the high-voltage system protective circuit breaker operated—probably ¼ to 1 sec.

If the mine protective ground circuit was physically interconnected to the main substation ground it is obvious that this high potential would be distributed to the frames of all portable machines, constituting a serious hazard. A similar hazard would occur when the primary or secondary lightning arresters discharge a voltage surge.

As a result of these considerations it is essential that the protective ground circuit originating at the neutral of the step-down transformer's secondary winding be insulated from the main substation ground system, with the same insulation level as applied to the low-tension line circuit and grounded at a separate earth grounding connection. The voltage gradient in the earth surrounding the main substation diminishes very rapid-

ly as one moves away from the substation. In general, a 50-ft separation is sufficient to avoid any substantial coupling between the two ground beds. It is important to avoid any direct interconnection between these two grounding points, such as, buried pipe lines, etc.

The question frequently is asked whether a 50-ft separation is always required between the station ground and protective ground points. The factor to remember is that the grounding points must be separated a sufficient distance to limit the potential rise at the protective grounding point to 100 V when fault current is flowing into the earth through the station grounding point. The potential gradient in the earth under this condition is shown in Fig. 3.

There are exceptional homogeneous soil conditions which could be met with a separation of 10 ft. Experience and measurement have shown, in most cases, that this distance can be somewhat less than 50 ft. However, making a voltage-gradient plot is rather expensive and practice has

been to separate the grounding points by at least 50 ft.

Maintenance of Ground-Wire Continuity

The success of resistance-grounded systems depends upon the continuity of the ground conductors in the feeder circuits—the most vulnerable portion on the circuit. Without a continuous path for the flow of ground-fault current the system is little better than an ungrounded system.

There are numerous methods employed to prove the continuity of ground conductors. Records of early installations show that ground-wire continuity was checked once every month by placing an intentional ground fault on the system at the load end of the feeders. More recently circuits have been developed to continuously check continuity, and they are arranged to automatically disconnect the power source upon loss of continuity.

Fig. 4. illustrates a continuous ground-continuity check circuit. In

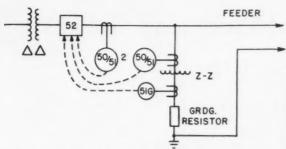


FIG. 6 – METHOD of grounding transformer protective relaying.

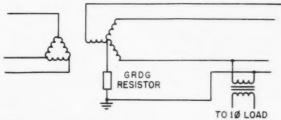


FIG. 7 - GROUNDING ERROR-connection of a single-phase transformer from line to neutral defeats purpose of resistor.

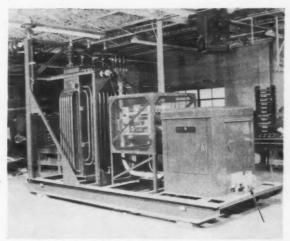


FIG. 8 – GROUNDING ERROR—insulation of cable coupler from skid is hazardous to personnel.

this system a small amount of DC is passed through a pilot conductor, included in the feeder cable, to the load end of the circuit and back to the source end of the circuit through the cable's ground conductors. In the event that the ground or pilot conductor becomes discontinuous the flow of current will be interrupted, causing a relay to trip the circuit breaker.

Grounding-System Requirements

Prior to discussion of the precautions to be observed in the installation and usage of protective-grounding systems, it is well to summarize the requirements, as follows:

- 1. Limit the frame-to-ground potential to 100 V.
- Use a solid metallic conductor for the ground-fault current-return path.
- 3. Limit the flow of fault current with a neutral-grounding resistor at the power source.
- 4. Arrange the circuit protective devices to de-energize feeder circuits automatically upon loss of groundwire continuity.
- 5. Prevent a dangerous potential from appearing on the protective

grounding circuit as a result of unlimited current flow into the station ground.

- 6. Use a continuous-rated neutral-grounding resistor.
- Connect all equipment frames and housing, conductor enclosures and similar normally nonenergized parts associate with the power-system feeders to the protective-ground conductors.

Grounding-System Precautions

Equally important to the successful operation of a ground system is the avoidance of conditions that would nullify the objective. While this is a somewhat negative approach it does point out bad practices which have been incorporated in protective-ground systems.

1. Do not enclose outdoor neutral-grounding resistors in nonventilated enclosures. It has been observed that some mine electricians have enclosed resistors in wooden or metal enclosures. A large quantity of energy is dissipated from these devices during a ground fault. For example, a resistor designed to limit ground-fault current to 50 amp on a 6,900-V system may dissipate 200 kw of power during a ground fault. There have been instances of igniting a wooden enclosure which, when it collapsed, caused destruction of the resistor.

In another case, the resistor had been enclosed in a sheet-metal housing. The buildup of heat during a fault caused warping of the resistance element and cracking of insulators. The warping of the resistance caused a portion of the resistor to be shorted. Consequently, the next time a ground fault occurred a greater amount of current flowed through the resistor causing more heat to be dissipated with the result that the complete resistor was destroyed and an unsafe condition was created.

- 2. Do not connect any part of the neutral-grounding system to the station ground. Outdoor neutral-grounding resistors are normally furnished with fully rated insulators to support and isolate the resistor frame from the resistor stand. The connection from the ground side of the resistor to the earthen grounding terminal should be made with a fully insulated single conductor properly installed. Fig. 5 is a photograph of a neutral-grounding resistor where it is possible that an unsafe condition may occur due to the use of a bare conductor between the ground side of the resistor and the protective-ground earth terminal.
- 3. Do not use a three-phase secondary-wye-connected transformer for the power source if it has a groundedwye secondary rating. Such a transformer has reduced insulation on its windings where they join at the neutral point and is designed only for use

How the Top 15 Coal-Producing Groups Ranked in 1960

Compiled by KEYSTONE COAL BUYERS MANUAL, A Coal Age Affiliate

Group or Company	1960	% Change	1959	% Change	Standing			
	Tonnage	1959 to 1960	Tonnage	1958 to 1959	1960	1959	1958	1957
Consolidation Group	29,016,180	- 6.4	31,019,548	+10.8	1	1	1	1
Peabody Group*	28,749,362	+11.8	25,698,844	+15.5	2	2	2	2
U. S. Steel (c)*	17,879,581	+18.8	15,046,987	-10.3	3	3	3	3
Pittston Group*	13,028,026	+ 3.2	12,623,648	+24.8	4	5	5	6
Island Creek	12,147,362	- 8.6	13,297,942	+27.2	5	4	4	4
Eastern Gas & Fuel	9,514,859	- 0.5	9,568,699	+ 0.2	6	6	7	7
Bethlehem Steel (c)*	9,255,930	+ 9.5	8,450,624	-16.2	7	7	6	5
Freeman	6,833,842	- 0.3	6,858,695	- 0.1	8	9	9	9
Ayrshire*	6,445,768	+12.4	5,731,459	+ 0.2	9	12	11	12
North American Group	6,325,245	- 0.3	6,347,338	+19.2	10	10	12	11
West Kentucky Group*	6,256,186	+ 5.4	5,932,870	+ 3.5	11	11	10	10
Truax-Traer	5,959,175	-14.4	6,962,804	- 3.5	12	8	8	8
Bell & Zoller*	4,364,214	+ 3.4	4,217,466	+ 4.1	13	16	18	25
Rochester & Pittsburgh (1)	4,238,356	- 5.0	4,461,736	+ 6.9	14	14	17	15
Pittsburg & Midway	4,154,897	- 5.3	4,391,364	+11.6	15	15	19	24
Totals	164,168,983	+ 2.2	160,601,024					

(c)-Captive * Companies with an increase

(1)—Includes Wildwood Coal Div., formerly Butler Consolidated Coal Co., acquired 6/16/60

The industry's top 15 producing organizations mined 164,168,983 tons in 1960, 39.7% of the total bituminous and lignite production in the U.S.A. 7 of these companies showed increases over 1959.

The percentage of the total produced by the top 15 continues to increase each year, ranging from 21.7% in 1950 to this new high of 39.7% in 1960. Every indication points to a continuation of this trend.

One newcomer appears in the top 15 this year, Bell & Zoller Coal Co. The record shows that this company has increased its production every year since 1953.

on solidly grounded systems. Use only transformers that have a fully insulated neutral on the secondary side.

4. Do not fuse the primary of zigzag grounding transformers where they are used on a delta-connected system to derive a neutral for protective grounding of the system. If one of the primary fuses is blown the system will act essentially as an ungrounded system. The recommended manner of protecting a grounding transformer, as shown in Fig. 6, is to use current transformers and overcurrent relays in the grounding-transformer primary which will cause tripping of the feeder circuit breaker if a fault occurs in the grounding transformer.

Do not locate the neutralgrounding resistor any farther from the system-neutral point than absolutely necessary to minimize the possibility of the resistor being short circuited.

6. Do not connect the ground wires in the feeder cable to any point other than the ground side of the neutralgrounding resistor at the substation in the mine-power system.

7. Do not connect any single-phase loads between a phase conductor and the ground conductor of a neutral-resistance grounded system (see Fig. 7). Failure to observe this rule will negate the purpose of the neutral-grounding resistor and result in an unsafe system. In addition, it should be noted that wye-connected loads should never have their neutral points grounded since this arrangement will cause solid grounding of the system. In either case the flow of ground-fault current will not be limited by the

neutral-grounding resistor properly.

8. Do not neglect the system components or fail to maintain and test them. This should include continuity of ground conductors, correct operation of the circuit-protective device and correct operation of the relays.

9. Do not insulate the frames and housings, coupler enclosures and similar metallic nonenergized parts of equipment used on the feeder circuit from the protective ground wires.

The concept of protective grounding of mine-power systems for personnel safety has been proved in many years of service. As far as it is known, there have been no fatalities on such systems due to ground faults where proper installation and maintenance practices have been incorporated.



Photo courtesy of The Jeffrey Mfg. Co.

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LOCAL DEPRESSIONS in the midst of national plenty is a paradox we can do without. In certain areas—notably, a number of coal-producing areas—the rate of total economic growth has slowed down, or stopped, or gone into reverse. These conditions prevail in spite of the fact that the amount of coal issuing from the mines in these areas has held fairly steady over the past few years.

The state of affairs that now exists is the effect of a number of causes, not any of which can be traced to fundamental weaknesses in the industry that is charged with producing the Nation's coal. First and foremost, the coal industry owes its survival through the last 15 yr to the intensive program of mechanization that held coal prices constant while wages soared. Something had to give in a situation like this, and it was

coal-mine employment. The machines displaced the men.

Then, post-war recovery in overseas countries introduced into the trade channels a flood of products that were competitive with our own goods. Since coal is vital to our manufacturing industry, any delay in the booming sales of our manufactured goods causes the coal industry to mark time. The net result is that coal production and consumption in this country did not increase as rapidly in the late '50's as was hoped. Thus it is that willing and able men are unemployed and communities languish. This is a waste of human resources; it must become a matter of concern to all.

Historical Parallels

Although it is of small comfort to

the man who is now out of work, similar disjointures have occurred before on the American scene. In the early 1800's 75% of our people were engaged in agriculture. Today, only about 10% of our people are farmers, and they produce more agricultural products than we can consume while we all enjoy the highest standard of living ever. Scientific farming with machinery makes the difference. Introduction of mechanical methods into any large industry inevitably leads to major changes in that segment of the economy.

It is worth emphasis, however, that the sweeping changes that occurred in agriculture in a century-and-a-half have occurred to a similar degree in the coal industry in a decade-and-a-half. The convulsive social problem that now exists is a result of this difference in time of occurrence.

In either case, farming or mining, the employment that was lost in one area was gained in another area, and the area bereaved of the jobs suffered in consequence. Pursuing the parallel one step further, as the number of jobs in agriculture declined the number of jobs in farm - machinery manufacturing increased. A similar adjustment is taking place, over the long term, in the case of coal. Some of this mining equipment is

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The entire unit is easily handled by one man. Controls are conveniently grouped at an operator's station located alongside the drilling area. The unit can be moved, leveling jacks hydraulically set, mast hydraulically raised, drill pipe and bits connected, and hole started all with a few nonfatiguing motions.

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The self-propelled LRD-2 is available either on crawler or tire mounting and with either gasoline or diesel power unit. A whole list of extra equipment is available to ease or speed drilling, including lights for night-time operation, a mounted bit grinder, air hoist, breakout tongs, water injection system, . . . all detailed in Specification Sheet AT-146. Write for your copy.



division of Westinghouse Air Brake Co.

Sidney, Ohio

Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

Foremen's Forum (Continued)

being manufactured in the heart of the coalfields, but evidently not enough of it to fill the need for employment opportunities.

Small Comfort

If the hope of distant relief is any consolation, the point might be made that the electric light did not replace the candle nor the oil lantern; it did replace going to bed with the chickens, and dark streets. The automobile did not replace the horse and buggy; it replaced the habit of staying home. In both instances vast changes were wrought in our manner of living, and many, many people found livelihood in "servicing" these new "services." We hope and expect that technological progress in coal utilization will do the same for us.

In the meantime, there in the depressed areas is the problem—and there in the far future is the prospect of a complete, happy adjustment. How to hasten the prospect?

Probable Solutions

Much ado will be made of the problem of depressed areas in the days immediately ahead. It is one of the gravest of the domestic issues facing the new Administration. Effective help toward solutions can be generated within the areas themselves, and that is why the matter is brought to your attention in these two pages. As community and business leaders you must be concerned.

Well, what are some of the approaches to the problem, promising some degree of successful solution? Consider these four:

- 1. Relocation of unemployed folks.
- 2. Providing local goods to local min-
- 3. Providing local services to local mining companies.
 - 4. Regional redevelopment.

Let's take up these possibilities one at a time to better determine how they can be of service in the present situation.

Relocation of unemployed men offers the most immediate solution—and the most severe. By relocation we mean the process of tearing up roots and moving to a new area to find work. This is an opportunity reserved primarily for the young. Yet the census bureau reports that in a single year the total number of voluntary "quits" is equal to about one-fourth of the total number of jobs in the economy. People do move around.

However the unemployed coal miner is likely to say, "Coal mining is all I know." It is necessary, therefore, to give thought to retraining programs if relocation is mentioned as a possible solution. Retraining is a subject in itself, so let's move on.

Providing local goods to local mining companies is a likely, pleasing prospect for some. Since fewer men are engaged in work about the mining property, more of the materials the company uses must be supplied in ready-to-use form or in semi-finished form. Searching out possibilities to be of service in this way requires some ingenuity, or perhaps a tip from interested mine management. We have in mind materials such as preassembled roof bolts, pre-cut check curtains, pre-shaped cappieces and so on.

Providing local services to local mining companies has been the basis for a number of successful small businesses. Enterprising persons in coal-mining areas have set up cable-repair shops, belt-repair services and similar centers in recent years. Some have grown into substantial firms. Contract hauling for coal companies, drilling, electrical repairing, metallizing and welding, photography and print copying are among a long list of other services used by coal companies. Of course, opportunities like these are not unlimited.

Regional redevelopment holds the

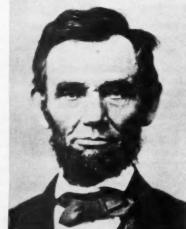
most promise for the most people, although it is the long-range solution to the depressed-area problem. The sound approach is to develop a favorable business climate locally. The first step is to take inventory of the weak points and strong points of the community with respect to its attractiveness to new industry. Plans must be made to overcome weaknesses and to exploit the strong points.

Then the advantages of the area must be publicized. The business sections of the New York Times every Sunday carry a number of regional ads, sponsored by railroads or utilities which serve the particular area, extolling the virtues of locating plants in—for example—the Ohio valley.

This is a selling job, and it is competitive. Other areas are trying to do the same thing. Redevelopment does not mean "pirating" plants from other areas. If you do that, you get just what you deserve—"fly-by-night" ventures jumping from one place to another in search of exploitable labor pools.

Furthermore, the real impetus must come from within. If there is no impetus from within the depressed area, then perhaps the area is not worth redevelopment. That's harsh, but it's really true. Give wholehearted support to the organizations and agencies that pursue these activities in your area.





Men who turned the crises remind us of . . .

The Heart of Greatness

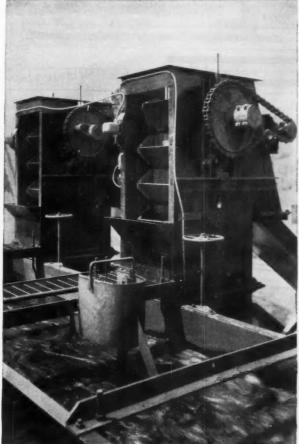
WASHINGTON and Lincoln, whose birth anniversaries are marked this month, fully understood the value of applied learning in their personal development. Washington learned the fundamentals of surveying—then he surveyed.

Lincoln schooled himself in law—then he practiced law. Coming from opposite ends of the social scale, the two American heroes exhibit the common trait of "eagerness to learn in order to apply." Intensity is the keyword. JIGGING stratifies materials according to specific gravity, separating solids in upward and downward pulsations of water. The heavier materials settle to the screen plate and are drawn off. The lighter materials overflow.

JIGGING is an almost universal separating process for materials ranging from the specific gravity of gold at 19 to coal at 1.3. Proportions of the high-gravity materials may vary from 90% to 10% or less.



a low-cost method of cleaning your coal...



Typical Jeffrey dense-medium jig in a coal preparation plant.

Jeffrey dense-medium plants are handling some of the world's toughest separation jobs, recovering coal of specified quality usually above 99.5%. A Jeffrey jig effectively separates coarse and fine sizes simultaneously, cleaning 8-inch to 100-mesh coal in the same jig. No necessity for prescreening jig feed.

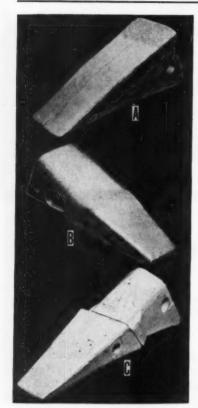
The float-and-sink process employed by Jeffrey uses bone from raw coal itself as the medium, so there's no expense for that. The jig recovers the medium and maintains it at the proper density. No auxiliary equipment is required, except a conveyor to return the medium. Only enough water is needed to transport the coal, so fine coals are recovered better and a smaller, less costly settling system suffices.

For help in selecting a jig for your coal cleaning work, write the Materials Preparation Division, The Jeffrey Manufacturing Company, Columbus 16, Ohio.



CONVEYING • PROCESSING • MINING EQUIPMENT TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Operating Ideas



TIP USES-A, for very hard material; B, for fracturing and penetration; and C, for very abrasive conditions.

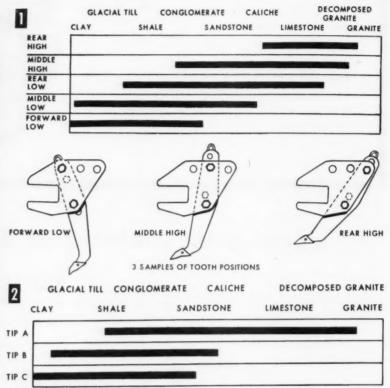


CHART I summarizes the settings of a 5-position clevis, according to the hardness of the material being ripped. Chart II is a guide to the type of tip to use in different materials.

How to Select Ripper-Tooth Tips

SELECTING the proper tooth tip for a ripping job can lead to a more profitable operation. Because tip replacement is frequent on most jobs, it is most important to be alert for changing conditions. What governs the type of tip to use? The following descriptions of typical ripping jobs and ripping suggestions, compiled by Caterpillar Tractor Co., may prove helpful on your ripping job.

Example A-Extremely hard limestone which sometimes required tandem ripping. Under these conditions strength was the most important factor in choosing the most economical tip. A large high-strength forging (Tip A with a 4in point) was recommended. The extreme rock hardness caused the tip to become blunt after only 15% wear, and it was replaced.

Example B-A layer of sandstone overburden was being ripped and bull-dozed from a Pennsylvania coal seam. In this case the ripping was not ex-

tremely difficult so a narrower tip (Tip B) was used for better penetration and fracturing. This tip is tapered to a 2½ in point and is undercut for self-sharpening.

Example C — Ripping decomposed sandstone so wheel tractor-scraper units could load and haul it was no problem but extreme abrasion caused rapid wear on ripper-tooth tips. It was here that the tip and boot combination (Tip C) gave the most economical performance. The strength of a one-piece was not needed and the small, inexpensive tip was replaced often without disturbing the boot. This tip tapers sharply from about 6 in to 3 in.

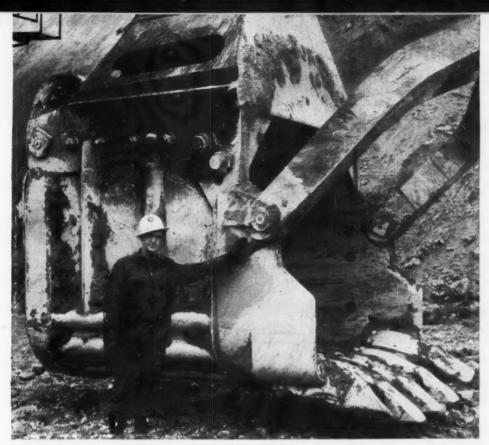
Although the above examples do not cover every ripping condition, they illustrate the wide range of general tip usage. In addition to the types described, there are tips combined with a mounted wedge or a wing dragged behind. This design loosens a wider swath

of material and in some conditions breaks it into smaller pieces.

Ripping angles are important in maintaining maximum production. The ripping angle is the one formed between the top side of the tip and the ground level. Different materials, even the same type at different stages of decomposition do not have similar optimum ripping angles. Test results show the most efficient ripping is done in a range between 40 and 50 deg.

These angles are determined by the clevis, or tooth mounting. There are two major types of clevis. The parallelogram mounting keeps the tooth at one angle regardless of depth of penetration. With the multi-position clevis, the angle varies with the tooth depth, thereby allowing a change of setting on the clevis to get the optimum angle for a certain material and depth.

As material increases in hardness, the depth of penetration becomes shallower but the ripping angle should aways remain between 40 and 50 deg.



TEETH TALK

and they say a mouthful— (USS) "T-1" Steel shovel

teeth outlast others five to one! D. T. Van Zandt, plant manager of U. S. Steel's Michigan Limestone Division at Rogers City, Michigan, says, "USS 'T-1' Steel in our shovel lasts five times as long as conventional steel. In our quarry we found this out the hard way-by numerous breakdowns and precious time lost for repairs. Carbon steel teeth lasted 80 hours. An alloy lasted 160 hours. Now, with "T-1" Steel, teeth life is 400 hours, and this is conservative! Each tooth costs roughly \$100—and we used about 200 teeth a year. Now we save most of that money." ☐ The bucket lip, too, is made from USS "T-1" Steel. Vast improvement in service life resulted, with much less bucket weight. This means speedier shovel operation. Also—the bucket has added toughness in cold weather - for "T-1" Steel is tough and strong even down to 50° below zero F. Here's a single steel that will handle impact, abrasion and shock. Maintenance consists only of cutting plates into teeth and welding them. USS "T-1" Steel has a minimum yield strength of 100,000 psi and is weldable and workable. You can't beat it for this kind of work. □ United States Steel makes other brands of steel of high strength levels for a wide variety of applications: USS COR-TEN, USS MAN-TEN, USS TRI-TEN for 50,000 psi minimum yield point, in addition to a complete range of carbon and Stainless Steels. For more information write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS, "T-1", MAN-TEN, COR-TEN and TRI-TEN are registered trademarks



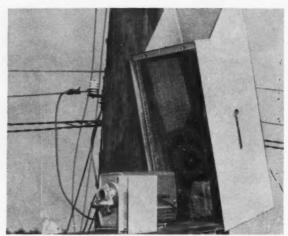




Operating Ideas (Continued)



WEIGHMASTER checks the loading position of trucks on closed-circuit TV receiver.



REMOTELY CONTROLLED camera with housing lifted has temperature-actuated heater and blower in box.

TV Ups Retail Sales Efficiency

AN ELECTRONIC EYE that sees into the company's yard and sends a picture of trucks loading to a receiver in the weighmaster's office has boosted truck handling efficiency 15% at the Honeybrook Colliery, Audenried, Pa. And it eliminates guesswork about the size of coal loaded by a truck.

The electronic eye, a Motorola closed-circuit television unit, monitors seven truck-loading stations at the company's retail yard which supplies nearly 200,000 tons annually to truck customers. Each bin holds a different size and

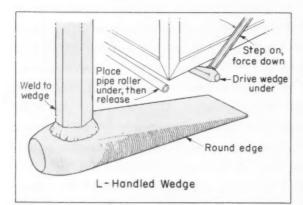
there is as much as \$6 per ton spread between prices. The television circuit now enables the weighmaster to note the type of coal a truck is loading. Before television there was no positive indication of the type of coal loaded until the driver stopped at the scale.

Empty trucks weigh in on a scale in front of the weighmaster's office, then drive to the bin. The weighmaster logs the trucks in and notes which bin it is loading from by glancing at the picture on the TV screen.

The time saved by the closed-TV cir-

cuit is particularly important in expediting local trucks which take on even quantities of certain sizes, said Superintendent Tom Davis. It also gives the weighmaster more time to weigh incoming trucks carrying raw coal.

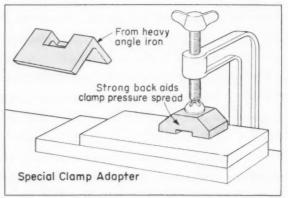
A fiberglass-lined weatherproof box houses the camera and a temperature-actuated heater and blower. It is mounted on a platform on a pole about 25 ft above the ground. The 14-in receiver is mounted in a corner of the office where the weighmaster can see it while performing other duties. Controls for both camera and receiver are mounted under the TV screen.



Practical Shop Tools

HERE'S A COUPLE of tools you can add to your shop that cannot be purchased, according to Charles H. Willey, Penacook, N. H.

The shop-made "L" handle wedge can be used for special handling of large units such as transformers, rotary converters, M-G sets, preparation equipment, etc. It can be made in various sizes for different applications. The handle wedge provides a means of raising heavy equipment so that pipe

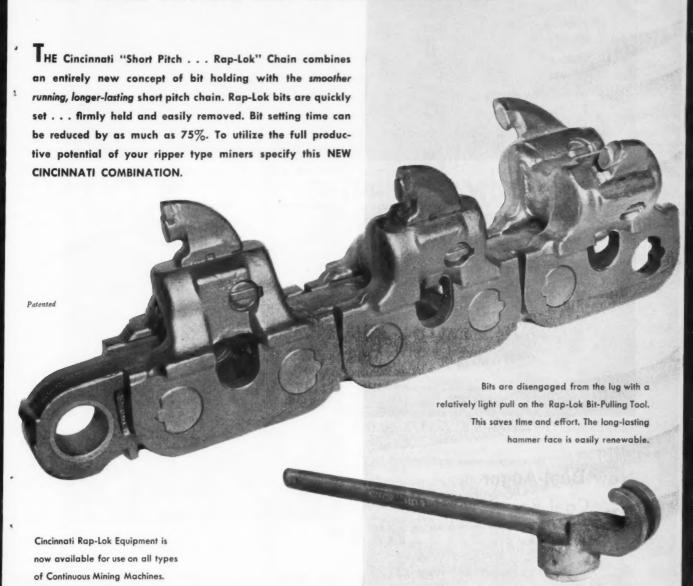


rollers or lifting jacks can be placed under them. It is especially useful when equipment does not provide built-in facilities for easy handling.

Special clamp adapters are useful in metal fabrication work in shops and preparation plants. These adapters are made of heavy-gage steel or angle iron as shown in the sketch. The trick is to spread the clamp pressure over more surface to get a better fit for welding, etc. Odd-shaped adapters can be made for special application where the work is repeated over a period of time.

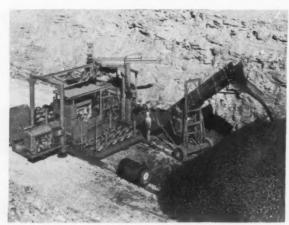
A NEW "CINCINNATI" COMBINATION

THE PROVEN SHORT PITCH RIPPER TYPE CHAIN WITH THE TIME SAVING RAP-LOCK PRINCIPLE

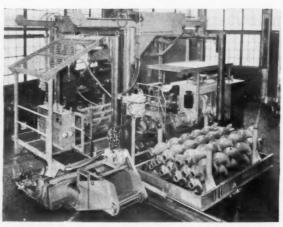


THE CINCINNATI MINE MACHINERY CO.

New Equipment News



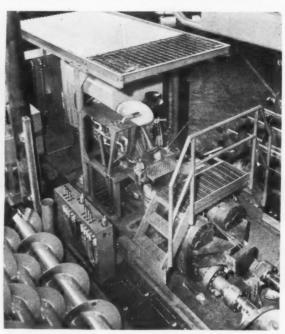
OVERALL VIEW of Salem Tool Co. dual-auger machine showing auger storage racks—each capable of storing 300 ft of auger.



CLOSEUP shows skid cylinder (lower right) and extendible auger guide (lower left) which eliminates coal spillage.



FRONT END of 18-in augers displaying specially designed rib breaker and cutting heads.



BANK of seven hydraulic control valves (left) directs skids, jacks and auger guide cylinders.

New Dual-Auger Coal Boring Machine

Charles Govin, Chief Engineer Salem Tool Co., Salem, Ohio

Harold Cullings, Technical Services Commercial Shearing & Stamping Co. Youngstown, Ohio

COAL AUGERING—recovery of lowseam coal—is now substantially faster through the use of hydraulic components on Salem Tool Co.'s new dualauger machine.

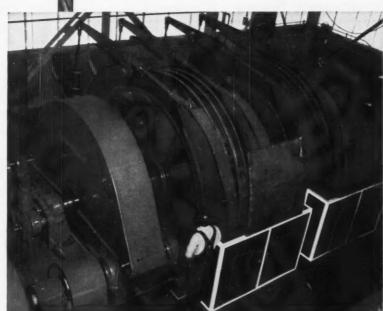
Mine operators are continually looking for equipment which will improve operations in three ways:

1. Increase rate of profitable production to meet competitive markets.

2. Provide a practical method to mine low-seam coal which presently cannot be mined at a profitable rate.

3. Provide a method of mining which will recover a higher percentage of available coal.

Salem Tool Co., Salem, Ohio-long a leader in coal auger mining equipment—has developed a 45-ton high-speed, all-hydraulic, self-propelled dual auger which, in recent tests run by a 3-man crew, mined an average of 300 tons of coal per 8-hr shift using twin 18-in



Hoists in the shaft tower.



For strength
..economy
...versatility

BETHANIZED WIRE ROPE SERVES HOISTS IN NEW HOMER-WAUSECA SHAFT

These friction hoists in the Homer-Wauseca iron ore mine are operated at Iron River, Mich., by the M. A. Hanna Co. The capacity of the hoists is 300 long tons per hour at 1,500-ft depth per hoist. The twelve hoist ropes used on the three lifts, 2,900-ft long, are 1-in. 6 x 27 H Bethanized Form-Set, improved plow steel, flattened strand, with fiber core. The 2,810-ft tail ropes are $1\frac{3}{8}$ -in. 18×7 Form-Set, traction steel, right lay, with fiber core, in Bethanized A and B coatings. The Bethanized coatings of high-purity zinc are applied electrolytically to the individual wires. Since the amount of lubrication on the ropes must be limited to maintain friction, the Bethanized coatings were chosen to provide extra corrosion-resistance.

Whatever the lifting assignment, you can count on Bethlehem Wire Rope for top performance . . . every time.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa. Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

There's a distributor of Bethlehem Rope near you, supplied by our nationwide network of wire rope mill depots.



New Equipment News (Continued)

augers. Design of the machine permits use of auger sizes of 18 through 30 in in diameter. The machine was able to bore a double hole, 150 ft deep, remove and store augers in machine racks, and move to the next position ready to bore again—a complete cycle in 38 min.

During this period, the machine bored a 150-ft hole in a vein that was only 3 in thicker than the diameter of the hole cut, and the augers remained in the vein during entire augering operation. This is made possible through a new auger rotation method—rotating each auger in an opposite direction, thereby eliminating the problem of one cutting head "climbing over" the other. By rotating the augers in opposite directions, loose coal is conveyed back on each individual auger rather than forcing coal from one head into the other auger string.

Another feature of Salem Tool's dual-augered machine is the improved auger handling system. Two special auger racks—capable of storing 300 ft of augers—have been added alongside the machine frame, rather than storing them within the framework of the machine itself.

Through the use of special Salem Tool telescopic hydraulic auger hoists a pair of augers can be placed in the machine in 8 sec after auger drive mechanism is returned to back position. Also, by incorporating the new hoists, machine length has been significantly reduced. Special hydraulic cylinders which actuate these hoists were designed and manufactured by Commercial Shearing & Stamping Co., Youngstown, Ohio.

Hydraulics play a major part in the greater efficiency of Salem Tool's new hydraulically - operated auger latches. Two pairs of cylinders, front and back, control latching pins which couple and

uncouple the augers from each other and from the machine.

The typical augering cycle which is repeated until the desired hole depths are obtained is as follows: The combination cutting heads and lead augers are forced into the coal by the thrust from two cylinders. The cutting torque is applied to the augers from a 250-hp diesel engine. The average time required for the pair of augers to advance into the coal 12 ft is 1.3 min. During this time, two more augers are placed in position ready for lowering into the machine. Hydraulic auger latches uncouple the drive head from augers and the carriage is returned to rear of machine hydraulically. The second pair of augers are now lowered into machine and augering cycle is repeated. The total time required for the above auger cycle is considerably less than 2 min.

All of the above motions are accomplished through a combination of Commercial Shearing & Stamping standard and specially designed pumps, directional control and relief valves, cylinders and motors which were provided to meet the requirements of Salem Tool Co.

To move the self-propelled machine from a completed pair of holes to the next position—normally accomplished by pulling a machine in place with a bull-dozer—six Commercial hydraulic cylinders are used to accomplish the job. A system of hydraulic skids and jacks are employed to lower the machine, move it horizontally to the next position, and raise it again in 1½ min—less time than is required to hook up a bulldozer.

During operation the machine weight rests on the four jacks, which serve a second function of keeping the machine level. After all but the lead auger sections have been returned to the storage racks after augering is completed, the skids are moved into position by two hydraulic cylinders. The machine frame is lowered onto the skids and a pair of cylinders pulls the machine over the skids into the new augering position.

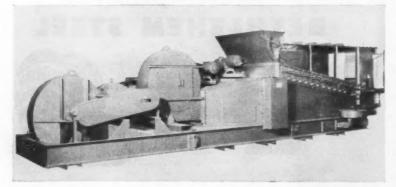
A number of advantages are derived from this newly designed dual auger as follows:

- 1. Practical depth of boring increased to 200 ft—a 100% increase over previously available equipment,
- 2. Cleaner coal since cutting heads stay within the vein rather than "drifting" into surrounding earth.
- 3. 50% increase of recovery rate of coal to be mined.
- Increased coal recovery because of newly designed rib breakers and special cutting heads.
- 5. Improved coal quality and size consistency, since coal is moved at an equal rate along both auger strings back to conveyor, thereby eliminating crushing already-cut coal.
- Greater tonnage per hr because of increased boring depth, faster hole-tohole positioning, and more rapid coal recovery.

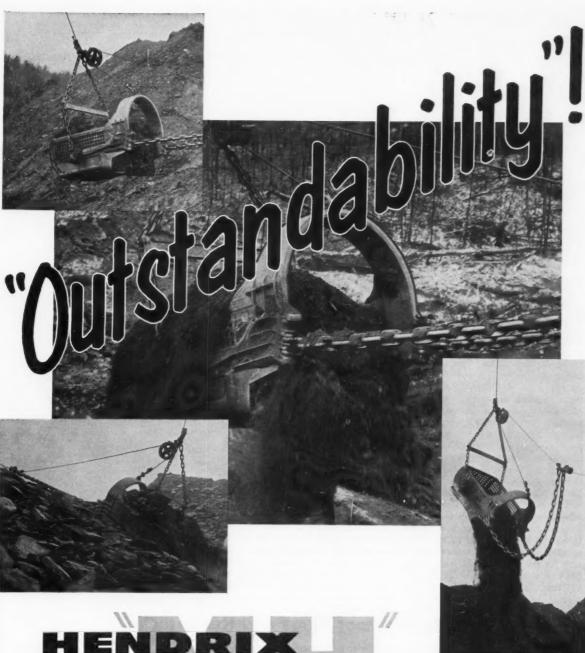
Salem Tool Co. notes additional improvements. Six feet shorter, and with greater maneuverability, this machine has an increased speed of operation built in by having all controls located so that the three operators never have to leave their positions. Added safety is a result. An improved high-wall screen and heavyduty grating for catwalks have also been added for operator safety.

The 45-ton machine has been reduced to a length of 29 ft through tight engineering and economical arrangement of component parts. Overall height is 16 ft and shipping width of the main frame is 10 ft

Dry Separator for 5/8x0 Coal



Operating on the dry separation principle which eliminates much accessory equipment, the new compact Ridge Airjig permits loading of clean coal just as it comes from the separator without extra processing. Counterbalanced rotating parts make heavy foundation structures unnecessary and with all motors, blowers etc. mounted on the same base with separator, the Airjig is easily transported on one truck. A dry separator for 5/8x0 coal, it is reported to perform efficiently even where feeds contain up to 8% moisture. Available in three standard models from 35- to 75-tph capacities, the Airjig is delivered ready to operate, according to Ridge Equipment Co., P.O. Fallentimber, Pa.



HENDRIX Heavy Duty Mining Buckets



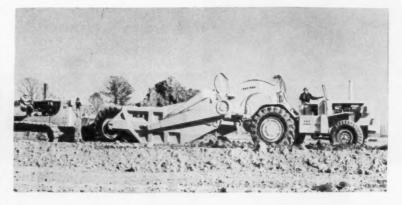
 $4\frac{1}{2}$ to 40 Cubic Yards With or Without Perforations

HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA



Tractor Scrapers

Two new, 420 maximum hp wheel tractor scrapers-4-wheel 630A (upper right) and 2-wheel 631A (lower right)featuring an exclusive torque divider power shift transmission, are offered by Caterpillar Tractor Co., Peoria, Ill. Primary consideration in the design of the units was the matched development of the torque divider power shift transmission with the new D343 diesel engine. Shifting is accomplished by moving the selector lever (upper left) to one of three speed range positions. Within each range, the most appropriate of three "drives" is automatically selected to meet changing power requirements. A dashmounted indicator shows when to shift to the next higher speed range. The 4valve-in-head diesel engine features individual porting of intake and exhaust valves and has a flywheel rating of 335 hp. Top speeds of the tractors are 41 mph for the 630A and 31 mph for the 631A. Specially developed 28-ply 29.5 x35 tires, "live" air-actuated cable con-

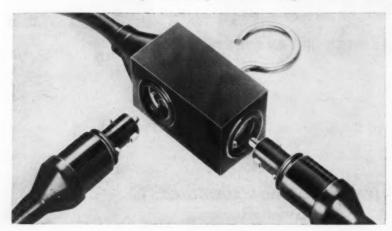




trols, advanced design steering systems and a high degree of service accessibility are other machine features. Scrapers are of Lowbowl design and have a struck capacity of 21 cu yd and a heaped capacity of 28 cu yd. Refinements to the basic Lowbowl concept permit corner

voids to be filled without staying excessively long in the cut. For extra-large production capabilities under special job conditions, the new 630A-482C tractorscraper combination will be available. The 482C has a 35 cu yd heaped capacity and 28 cu yd struck.

Explosionproof Plugs and Receptacles



Explosionproof plugs and receptacles for safe, rapid connection and disconnection of permanent or portable electric light and power distribution systems in hazardous areas have been introduced by J. B. Nottingham & Co., Inc., 441 Lexington Ave., New York 17, N. Y. Inserting plug into receptacle forms sealed chamber in which contacts engage and close circuit, making it impossible for spark to ignite explosive atmosphere. Blocks with 4 and 6 receptacles are also available. The new "Industriline" units may be used with 2-, 3-, or 4-wire circuits rated as high as 240 V, 15 amp or 120 V, 30 amp. The plug and receptacle contacts of electrical-grade copper are solidly encased in neoprene bodies.





Carboloy® quality machine bits bite out more tonnage per shift ... last longer ... give you the best return on your investment.

When did you last buy a bit at a bargain? Did you really save? Probably not. "Bargain basement" bits have a real knack for costing you more than you save in the first place.

That's why you'll never find Carboloy mining bits "on sale in the bargain basement." Quality pays for itself over and over—and we refuse to sacrifice quality for the sake of a few extra "one-time" sales.

When you choose Carboloy mining bits for your operation, you'll get more tonnage per shift . . . the bits will last longer . . . and you get a real return on the money you've invested.

Your Authorized Carboloy Mining Tool Distributor has all the facts, And, there's a Carboloy engineer in your area to help you. Write: Metallurgical Products Department of General Electric Company, 11120 E. 8 Mile Avenue, Detroit 32, Michigan.

CARBOLOY.

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL (ELECTRIC

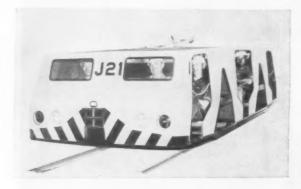
CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS

MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

New Equipment News (Continued)

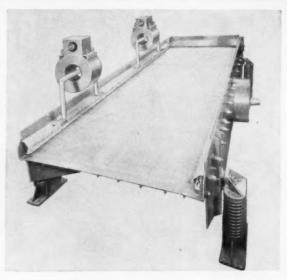
Flux Power Heating

"Hanco" flux power electric screen heaters, developed by F. R. Hannon & Sons, Canton 7, Ohio, conducts 0-4,000 amp through the air, thus eliminating costly replacement of flexible cables and leaf type laminated conductors which also tend to restrict vibration. Featuring a 5-yr guarantee, the heater is waterproof, dusttight, 220/440/550 V and 3 phase or larger models. A hollow ventilated conductor bar transmits power from the heater unit to the screen and is so designed that it can be rigidly fastened to the screen frame. This bar passes through the opening or eye of the heater and picks up the power transmitted through the air, excluding the need for an electromechanical connection. Several types of screen cloth tensioning devices are offered.

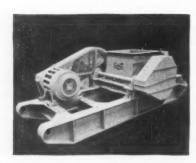


High-Low Coal Travel

A new type of car for transportation of workmen in coal mines, available in models for high coal and in units as low as



24 in for low coal production, is being produced by the Greensburg Div. of National Mine Service Co., 2530 Koppers Bldg., Pittsburgh 19, Pa. Called "ManKar," the new carrier may be powered with self-contained batteries or from a trolley wire. Safety features include excellent visibility, rigid unit construction and ability to run at high speeds without danger of derailment. Basic controls are flexible in that they can be furnished in numerous ways to suit particular needs—e.g., in the center of the car, at either or both ends, or as dual control systems. Drum controllers are standard; camtactor and full magnetic contactor type controllers are optional. Brakes are hydraulically-powered drum type with expanding shoes; standing brake being mechanical.



Skid-Base Crusher

A new skid-base crusher which is movable for following underground mining operations has been introduced by McLanahan & Stone Corp., Hollidaysburg, Pa. The unit includes a self-contained motor and a McLanahan Black Diamond single roll crusher mounted on a heavy-duty skid-type base. Among other features are a 22x7-ft skid, 100-hp motor and a 36x48-in fabricated Black Diamond crusher. Design includes split frames on the crusher and skid to allow entry through very narrow vertical

shafts. Construction is such that a chainflight unit feeds the crusher while the crushed product is removed by a portable belt conveyor.

All-Purpose Vehicle

A compact, all-purpose vehicle named the "Scout," said to represent a new concept in low-cost transportation, will be introduced early in 1961 by the International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Design features include an integral pickup body, a detachable hardtop cab and detachable doors. A detachable steel enclosure for both passenger compartment and loadspace area will be available as well as either 2- or 4-wheel drive. Wheelbase measures 100 in and overall length less than 13 ft. The Scout will be powered by a newly-developed 4-cylinder engine featuring power and economy. Snow plows, winches and other equipment items will be included in the wide variety of attachments to be offered.



PORTABLE BELT VULCANIZER—
"Vulcapress," a portable belt vulcanizer is introduced by Vulcan Equipment Co. Ltd., Toronto, Canada, is said to simplify conveyor belt splicing, reduce failure and offer for the first time perfectly even and accurately controlled platen pressure. It is electrically heated, can be handled by one man and easily dismantled. Vulcapress will be produced in the U. S. by Alm Press Co. Ltd., a subsidiary of Vulcan, in Niagara Falls, N. Y.



On-the-job reports confirm that wherever the revolutionary Manitowoc 4500 VICON has gone to work, master mechanics say drum and swing clutch life is appreciably longer than on other excavators in the pits. A typical comment: "In the year that our Manitowoc 4500 VICON has been in operation, we've replaced only one clutch facing. In our other shovels, where clutches are not engaged before accelerating the engine, wear on clutch facings is at least 25% greater." The reason: INTE-GRATED CONTROLS, one of several pace-setting developments incorporated into VICON design.

VICON operating levers are combination clutch controls and engine throttles. The clutches respond to a lower range of control pressures than do the throttles, so they are always engaged before engine speed is increased. With slippage therefore kept to a minimum, there's far less wear of friction linings, far less heat. Clutches run cool, last longer.

Here are more outstanding advantages of the remarkable Manitowoc 4500 VICON. INTERLOCKED DRUMS give you higher cycle speeds and pinpoint bucket control for increased dragline production. With DUAL INDEPENDENT ENGINES, the operator can perform several functions simultaneously with full power instantly available for each... has a choice of speeds at his fingertips to match cycle phases to job conditions.

The 4500 VICON is offered as a 6-yd. shovel or 7-yd. dragline. See your Manitowoc distributor for complete details, or write for the fully illustrated 16-page VICON catalog (No. 33-60).

SHOVELS 11/4 to 6 YDS



MANITOWOC ENGINEERING CORP.

(A subsidiary of The Manitowoo Company, Inc.)

MANITOWOC, WISCONSIN

only

FLUO SOLIDS®

combines...

- · compact, unitized design
- pulverized coal fuel system
- pressurized operation
- · uniform control
- adaptability to all tonnages and feed sizes

for simplest, most economical

Since the Dorrco® FluoSolids System for coal drying was introduced by Dorr-Oliver on a commercial basis in 1954, its phenomenal success has caused a revolution in coal drying techniques. Despite advances made in other systems, the basic simplicity and efficiency of the Dorrco design have remained unchallenged.

The Dorrco FluoSolids System is the only coal drying equipment combining the following advantages:

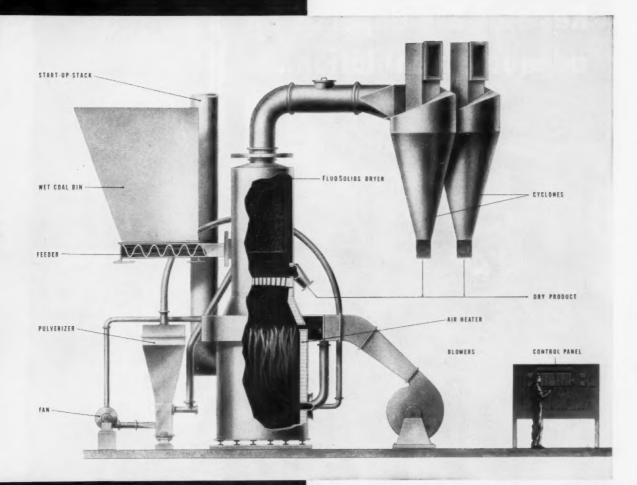
COMPACT, UNITIZED DESIGN: Air pre-heating and coal drying are carried out in a single basic unit, without the need for a separate furnace, stokers, or other auxiliary equipment. Space is conserved, installation simplified and maximum use made of heating BTUs.

PULVERIZED COAL FUEL SYSTEM: The modern Dorrco design includes a system for burning pulverized coal automatically extracted from the drying compartment.

Rapid start-ups and shut-downs are possible and no fuel is burned during shut-down as in banked stokers. No ash handling equipment is required. The system lends itself to accurate, automatic control, with quick response to varying feed conditions.

PRESSURIZED OPERATION: Pressurized hot air supplied to the drying compartment improves drying efficiency, eliminates the need for an exhaust fan to handle dirty and corrosive exhaust gases. Compared with other systems, lower air volumes are required with corresponding savings in horsepower. Easily controlled humidity conditions prevent overdrying and promote maximum cyclone efficiencies.

UNIFORM PRODUCT CONTROL: Feed rate adjusts automatically with variations in moisture to give uniform drying and complete control of product.



coal drying

ADAPTABILITY TO ALL TONNAGES AND FEED SIZES:

The Dorrco FluoSolids System is applicable to operations as high as 800 TPH in a single unit. Feeds can vary from filter cake to $1\frac{1}{2}$ " x 0 coal.

The FluoSolids Dryer is the most advanced equipment available to meet today's demands for automation and efficiency in economical preparation plant operation. For information on its application to your particular specifications, write Dorr-Oliver Incorporated, Stamford, Connecticut.

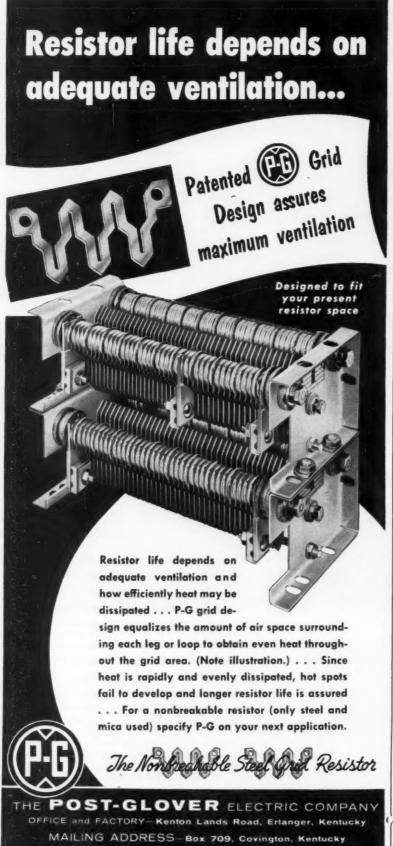
HERE'S HOW THE DORRCO FLUOSOLIDS SYSTEM OPERATES:

The drawing above shows the essentially simple operation of a typical FluoSolids coal drying system. The basic unit is a combined air pre-heating chamber and drying compartment separated by a constriction plate. Heat is generated in the lower chamber by burning coal which is withdrawn automatically from the drying unit above and pulverized before being supplied to the burner.

Hot gases under moderate pressure, tempered by the introduction of additional air from a bustle pipe midway around the heater, rise through the constriction plate into the dryer. Wet feed is automatically conducted into the drying compartment by a screw conveyor.

The action of the pressurized gases "fluidizes" the incoming coal, holding it in suspension so that every particle is surrounded by a film of hot gas causing extremely rapid heat transfer rates. Consequently, water evaporation is practically instantaneous. Finer fractions of dried coal are carried upward and collected by a cyclone system. No exhaust fan is needed. Larger coal particles are automatically and continuously discharged.





New Equipment (Continued)



AIR VIBRATORS—The Navco HCP line of heavy-duty air vibrators announced by National Air Vibrator Co., 435 Literary Ave., Cleveland 13, Ohio, are reported to cut unloading time up to 70% on covered railroad hopper cars. Features include exceptionally long piston stroke with the piston the only moving part, exclusive "free ride" design, and stainless steel mounting head. Two models available.



ROTARY DRILL RIGS—A new line of mechanical drive rotary drills for bit sizes of 3- to 4½- and 6- to 7%-in has been presented by Le Roi Div., Westinghouse Air Brake Co., Sidney, Ohio. Designated the LRD-2 and LRD-3, these units are truck, crawler or wheel mounted for rotary or down-the-hole drilling.

NEW CONCEPT

CRUSHERS IN

Low Headroom

Electrically Welded, Steel Frame and Housing

Single, Heavy,

Hydraulic Adjustment While Operating

Effective Tramp Iron Protection

> Misalignment of Rolls Impossible

> > Quick Adjustment for Primary Crusher-with



Simple Assembly,

Single

Easily Accessible

Balanced V-Belt Drive

> FINES TWO-STAGE DESIGN

REDUCES BLOCKY

RUN-OF-MINE

VARIOUS SIZES

MINIMUM OF

COAL TO

WITH A

- SINGLE-DRIVE IN A STEEL FRAME

THOROUGHLY **PROVED** IN NUMEROUS

PLANTS

Self-Aligning Roller Bearings Throughout

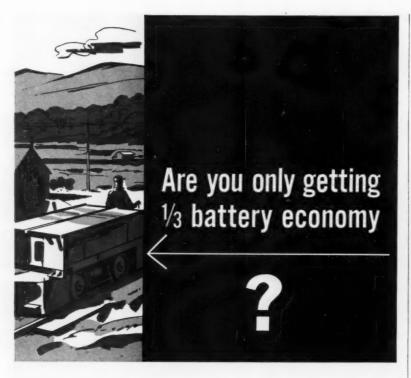
Send for Bulletin TR-20

NAHAN

TRIPLE ROLL CRUSHER

McLANAHAN & STONE CORPORATION

Pit, Mine and Quarry Equipment **Headquarters Since 1835** Hollidaysburg, Pa.



Do you buy batteries without considering the other two factors in battery economy: chargers and service? Exide has a plan to help you get all the economy possible from your mine locomotive batteries. It's the Exide power package—including batteries, chargers and service. It will save you money in the beginning and every year thereafter.

First, Exide will recommend the particular type and size battery that meets your needs exactly—at the lowest cost per year of use. Only Exide offers so broad a line: Exide-Ironclad for maximum capacity per cubic inch; Exide-Powerclad, the premium quality flat plate; and Exide nickel-iron-alkaline, the long life battery invented by Thomas A. Edison.

Second, Exide will provide the chargers, needed by your batteries to match their capacity, at lowest original cost and with efficiency to insure electric power economy.

Third, Exide factory-trained field men will help you keep both your batteries and chargers in top operating condition for long, dependable life. These men are specialists in Exide industrial battery equipment. Over 200 service specialists located coast to coast assure you of fast service when you need it.

Write for full details on the Exide power package. Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



INDUSTRIAL MARKETING DIVISION
The Electric Storage Battery Company



New Equipment (Continued)

The LRD-2, a one-man rig, drills a 3- to 4½-in hole with rotary or down-the-hole tools to a depth of 25 ft without changing pipe. The LRD-3 (photo), a 6- to 73%-in drill, transmits power from the engine through the sub-drive case and transmission to the drive shaft. Address request for further information to the Sales Dept. of the company.

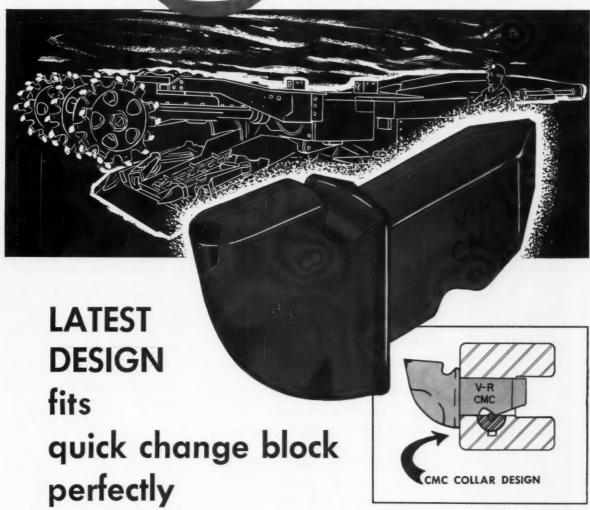


SPEED REDUCERS—Cleveland Worm & Gear Div., Eaton Mfg. Co., 3300 E. 80th St., Cleveland 4, Ohio, has announced a line of worm gear speed reducers available in nine sizes ranging between 3- and 12-in center distances. Ratios extend from 4½:1 to 95:1, ratings to 175 hp. Advantages are due mainly to fan cooling. The plastic or aluminum radial fan is mounted on the input side of the worm shaft to efficiently scour the finned outer wall of the reducer.



SLUDGE PUMP—Consisting of a pump unit and 220-, 440- or 550-V electric motor in aluminum housing, the "Flygt CS-100" is a compact, fully submersible 4-in trash and sewage pump for handling sludge and slurries, liquids and muddy water containing solids. Made by





Latest design style CMC Red Bits features a new, all-around collar that increases bit, lug and retaining pin life — gives the following advantages:

- I. Perfect fit in quick change block bit seats solidly with no wobble.
 - 2. Collar bears equally on all sides gives uniform wear on lug.
 - 3. Collar keeps fines from packing in lug bit changes are quicker and easier.

Cylindrical carbide tips, brazed into cylindrical pockets, enable these new bits to withstand extremely rugged cutting conditions. These carbide tips, manufactured by V-R, are quality-controlled from ore to finished product. Use the bits that are the first choice of miners everywhere — put V-R style CMC Red Bits to work on your equipment today.



CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

830 MARKET STREET

WAUKEGAN, ILLINOIS

New Equipment (Continued)

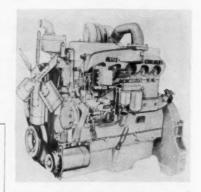
Flygt Corp., Hoosick Falls, N. Y., the unit incorporates a nonclog impeller which requires no strainer.

STORAGE COVER—Development of a plastic-laminated burlap outdoor storage cover, available in a wide range of sizes and in flat form or preformed construction, has been announced by the Bemis Bro. Bag Co. Being marketed under the name "Burlene," the new cover is a development of the Bemis Paper Specialty Plant, 1058 W. Vaneventer Ave., St. Louis 10, Mo. Benefits include water

resistance, tear- and puncture-resistance and multiple-use achieved through the special burlap and polyethylene lamination process. Seams and hems are rubberized and heat fused. Although water resistant, the plasticized construction permits escape of condensation. The cover is available with a rustproof spur grommet anchored to the hem.

HEAT-RESISTANT FIBER—An all-organic, heat-resistant fiber called "Pluton," which retains its flexibility and part of its strength after exposure to intense heat is offered by Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn. Available as a fabric, it can also

be worked into laminates reinforced with high-temperature phenolic resin to form structural parts or molding compounds. Some potential uses are antiarc wraps in electrical power plants, lightweight fire-protective curtains in mines, etc.



DIESEL ENGINES—A 145-hp naturally-aspirated Model 10000 engine and a 210-hp turbocharged 11000 engine have been added to the diesel engine line of Allis-Chalmers Mfg. Co., 986 S. 70th St., Milwaukee 1, Wis. Both are 6 cylinders, have 516 cu in piston displacement, 4-7/16 in bore and 5-9/16-in stroke. Available as either open or closed power units, as off-highway engines, packaged torque converter units, for diesel electric sets and for marine use, the engines feature economy, easy starting and simplified servicing.

VIBRATORY FEEDER-The third and final in a new series of heavy duty vibratory feeders has been announced by Syntron Co., 975 Lexington Ave., Homer City, Pa. Rated at 350 tph, the "FH-45" will be used as an intermediate feeder between the company's present models F-45 (200 tph) and F-55 (500 tph). A stepless control of feed rate can be adjusted from maximum capacity down to 10% of maximum capacity. The FH-45 is furnished complete with separate controller for 230- or 460-V, 60cycle, single-phase, AC operation. Other models in the new series are the FH-22 (40 tph) and the FH-33 (75 tph).

Equipment Shorts

High Speed Steel—A new grade of high speed steel—"Rex 49"—designed to provide greatly increased tool life in machining hard-to-cut metals, has been developed by Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 22, Pa. With a base price of \$2.07 per lb, this steel can be heat treated to Rockwell "C" 67 to 69, and is said to increase tool life from 200 to 400%.

Lubricant Spray-A free trial aerosol can of "Mechanic's Thread Loosener



The Service Elevator for Preparation Plants and Underground Installations

- REDUCE DOWN TIME
- ELIMINATE FATIGUE
- . SPEED UP MAINTENANCE

This all-steel Connellsville MINICAGE with 1000 lbs. and up capacity travels the outside wall of an existing preparation plant . . . or may be designed for inside a future-planned facility. Operates automatically at speeds of 50 to 75 feet a minute.

The sturdy fabricated steel structure with pantograph-style gate is mounted in place and safely attached to wall. Drive assembly at top of structure is coordinated with the MINICAGE and level doors by a control system. Wall openings at levels have hinged safety doors.

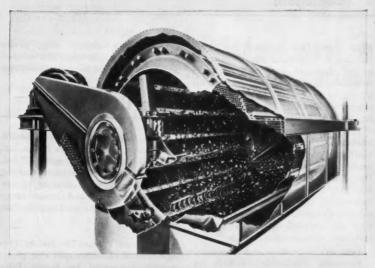
The entire Connellsville MINICAGE installation complies with federal and state mining laws.

For additional information and details on the Connellsville MINICAGE and other elevators, cages, hoists and conversion units, write for Bulletin No. 200.

Connellsville Corporation



formerly Connellsville Mfg. & Mine Supply Co.
CONNELLSVILLE, PENNSYLVANIA



PENNSYLVANIA BRADFORD BREAKERS prepare over 160 million tons of coal each year

Because no other coal processing machine does so much for so little—Pennsylvania Bradford Breakers have become a standard of the industry.

At power plants, by-product coke plants, coal mines and coal cleaning plants Pennsylvania Bradfords clean, size and scavenge at phenomenal low cost.

Data from 10 installations over 8 years shows an average maintenance cost of \$.001 per ton, and an average power consumption of .204 KW per ton.

TRIPLE ACTION

Continuously charged, the Pennsylvania Bradford immediately screens out passing sizes of coal through the screen plates. Larger lumps are raised and dropped, breaking by gravity impact until they are screened. All refuse—sulphur balls, slate, rock, tramp iron, etc.—resist breakage and travel the full length of the breaker where they are discharged.

BRADFORD-HAMMERMILLS

For reduction of particularly hard coals and for heavier loading, Bradford-Hammermills are frequently specified. This machine combines a concentrically-mounted rotor of a hard-hitting Pennsylvania Hammermill at the rear end of the slow speed Bradford Breaker. Capacities are increased over 20%.

Pennsylvania Bradford crushes, sizes, scavenges all in one operation—at lowest cost

FREE BULLETIN

For the full story on Pennsylvania Bradford Breakers and Bradford-Hammermills write for Bulletin 3007.

RING-TYPE Granulators

For preparing coals for stoker and pulverizer fuel, and other uses where overgrinding is undesirable, Pennsylvania Ring-type Granulators have no peer. Exclusive design; exclusive advantages. Completely described in Bulletin 9002. Send for it.



PENNSYLVANIA CRUSHER DIVISION BATH IRON WORKS CORPORATION WEST CHESTER, PENNA.

Over 50 years concentrated experience in all types of material reduction makes Pennsylvania your best source of crushers and engineering advice and service. Call on Pennsylvania with your next crushing problem. Representatives from coast-to-coast.



New Equipment News (Continued)

(Easy Spray)" for freeing tight, rusted or seized parts is available to any interested company from Whitmore Mfg. Co., P. O. Box 1640, Cleveland 4, Ohio. Recommended for all climatic conditions, this non-gumming lubricant is packaged in a 16-oz pushbutton container.

Elapsed Time Meter—The "Type BH-351" elapsed time meter, with or without reset knob and mounted from front or back of panel, indicates the total time a circuit is energized. Suited for such applications as tube replacement programs and maintenance scheduling of electrical equipment, the meter has ix register wheels indicating up to 99,-999.9 hr. Offered by Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Automatic Fan Drive—International Harvester Co.'s Motor Truck Div., 180 N. Michigan Ave., Chicago 1, Ill., has developed an automatic fan drive for heavy-duty International V-8 truck engines. Located behind the fan, the new drive is an electromagnetic clutch activated by a highly sensitive thermostatic control preset to engage and disengage the clutch between desired engine operating temperature limits.

Motor Pulley Drives—Variable speed motor pulley drives available in ratings of from 1 through 15 hp have been announced by Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif. Output speeds range from 2,200 to 141 rpm with a 3 to 1 speed variation utilizing 1,750 or 1,160 rpm motors.

Submersible Pump—Model 3VS1 is a 3-in centrifugal, dewatering pump powered by a 5 hp, 3,450 rpm, 60 cycle electric motor and is available in three voltage selections. Capacity range is 10 gpm at 120 ft of head to 300 gpm at 10 ft of head. Compete unit weighs 128 lb; pump, 95 lb. Motor, seal and bearings run in oil and two seals one at motor end and one at pump end, are enclosed in an oil-filled housing. For further details, write Gorman-Rupp Co., 305 Bowman St., Mansfield, Ohio.

Submersible Motors—Reliance Electric & Engrg. Co., 24701 Euclid Ave., Cleveland 17, Ohio, has introduced a new line of submersible AC motors rated at 55 C temperature rise for 30-min duty in 40 C air and for continuous duty in 40 C liquids. Offered in sizes from ½ to 40 hp for operation from polyphase power sources and from ¾ to 5 hp for single-phase connection, the pressure- and leak-

proof motors are designed for closecoupling to centrifugal pumps operating in any depth of water, oil or liquid chemicals. The "Liqui-Seal" construction is said to give total protection against bearing wear. Other features available.

Test Unit—A small manually-operated insulation resistance tester with crank handle for use in a wide range of field applications, is offered by Multi-Amp Div., Multi-Amp Electronic Corp., P. O. Box 217, Union, N. J. Tests with this lightweight, portable, unit indicate insulation deterioration on almost every class of electrical apparatus, devices, parts and wiring systems.

Pneumatic Trailer—A twin-tank dry bulk materials trailer equipped for self unloading by air is offered by Heil Co., Milwaukee 1, Wis. The trailer reportedly can unload up to 4,000 lb per min through a 4-in pipe as a result of a new pneumatic principle involving the use of high pressure with low air volume which makes the material flow through the unloading pipe in a "hi-density" condition.

Air Ducting—"BEP Ventilation Tubing" is the name given to a new form of air ducting made from "Fabron" polyvinyl chloride, said to be a lightweight, tough, very hard wearing and economical material. Fabron reportedly does not support combustion and is self extinguishing. Tube diameters of from 10 to 30 in in 3 weights—12, 16 and 20 oz—provide air ducting to suit restricted space in almost every type of underground roadway. Priced from 30c to 96c per lineal foot, this air ducting can be obtained from B. E. P. Industrial Equipment, 6346 W. McNichol, Detroit 21, Mich.

Filtration—A lubrication-oil filter element known as "7M 3800" (replacing 9F 6700), featuring a considerable increase in filtration efficiency without a loss in service life, has been announced by Caterpillar Tractor Co., Peoria, Ill. Developments making possible the greater degree of impurity removal are found in construction of the filtering paper which is stronger, thicker and removes more contaminants from the oil than earlier materials.

Transmission — Roberts Electric Co., 849 W. Grand Ave., Chicago 22, Ill., has announced a 10-hp variable speed hydraulic transmission. It is said to provide variable speeds from 0 to 1,600 rpm for high-torque, heavy-duty applications. Features include drive at 1,800 rpm or less with any 2- to 10-hp motor or 20-hp

gas engine, continuous duty, precise speed selection, lightweight and compact, and ball and roller bearings throughout.

Free Bulletins

Pump Selection—For users of centrifugal pumps, Dean Brothers Pumps Inc., 323 W. 10th St., Indianapolis 7, Ind., has published a 12-p selection catalog. Included are charts showing recommended temperature and pressure ranges for 10 classifications of Dean Brothers pumps.

Centrifugal Pumps—The line of Type AJV vertical two-stage split case pumps recently announced by Aurora Pump Div., New York Air Brake Co., Aurora, Ill., are illustrated and described in Bulletin 106-V.

Screening Products—Cleveland Wire Cloth & Mfg. Co., 3573 E. 78th St., Cleveland 5, Ohio, offers a loose leaf specification catalog containing bulletins describing the company's industrial wire cloth and wire screen products. Ask for Bulletin 160.

Hoists-Special purpose hoists, custom built to fit the job for every range of power, are described in Bulletin SPH-6A available from Ideco, Div. of Dresser Industries Inc., P. O. Box 1331, Dallas, Tex.

Bucket Elevators—Extensive information on industrial bucket elevators for the handling of bulk materials is contained in Bulletin 174 from Hewitt-Robins Incorporated, 666 Glenbrook Rd., Stamford, Conn.

Replacement Parts—"The Inside Story" points up some of the differences, both large and small, which can mean longer life and greater production for engines when original manufacturers' replacement parts are used. Booklet DE040 can be obtained at Caterpillar dealerships or from the Adv. Div., Caterpillar Tractor Co., Peoria, Ill.

Shuttle Cars—For Catalog G-148 covering shuttle cars for use in low and intermediate height seams in underground mines, write Goodman Mfg. Co., Halsted St. & 48th Pl., Chicago 9, Ill.

Hoists—A quick reference brochure for users of industrial hoists is offered by Coffing Hoist Div., Duff-Norton Co., Gateway Four, Pittsburgh 22, Pa. Included in Catalog 600 are complete specification tables. Yieldable Arches—The Adv. Dept., Commercial Shearing & Stamping Co., 1775 Logan Ave., Youngstown 1, Ohio, will send on request Catalog 300-C3 on Commercial TH yieldable arches. Twelve case history photographs of typical applications are shown.

Alloy Steels—Two multicolor brochures describing Jalloy-S and Jalloy-AR, new alloy steel series, have been published by Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.

Wire Rope—A new wire rope design the manufacturer says consists essentially of seven rope strands helically laid around a core is revealed in Bulletin 60100 from Macwhyte Wire Rope Co., Dept. P.R., Kenosha, Wis.

Lubricants—"Sunoco Petroleum Products for Automotive and Off-the-Road Equipment" gives descriptions and suggested applications for the company's complete line of diesel and gasoline motor oils, gear lubricants, transmission fluids and greases. Offered by Industrial Products Dept., Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

Earthmoving—Bulletin CL-60S of the Baldwin-Lima-Hamilton Corp., Construction Equipment Div., Lima, Ohio, features LIMA shovels, cranes, draglines and roadpacker vibratory compactors.

Scraper Power—Bulletin TP-442 describing the V-Power B Tournapull is available from LeTourneau-Westinghouse Co., 2301 NE Adams St., Peoria, Ill. Many of the operating features of the B Pull as well as details on the 430 hp, GM 12V-71 engine, transmission and other components are included.

Load Centers—General Electric Co., Schenectady 5, N. Y., has announced availability of Bulletin GEA-7306 listing applications for G.E.'s portable AC power supply units rated 45 through 600 kva with a primary voltage of 2,400, 4,160 or 7,200 V and a secondary voltage of 480Y/277 V.

Portable Duct—A descriptive brochure on Spiratube, its construction and uses, is offered by Flexible Tubing Corp., Guilford, Conn. The 4-p booklet gives specifications of the lightweight, rugged, portable duct used for ventilation, materials handling, and fume and dust removal systems.

Trailing Cable—Data on a flexible, easily handled trailing cable, job designed for continuous coal-mining machines, is contained in Folder DM-5944 offered by Dept. EFL, Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

SIZE CONSIST

judged most important coal property for combustion performance

COAL PROPERTIES SIGNIFICANCE CHART FOR COMBUSTION PERFORMANCE

	STOKERS							
	S.R.	M.R.	T.G.	5.5.	P.F.	Cyclone		
1. Size consist (as fired)	V	1	1	V	V 1	٧		
2. Moisture 2	M	M	N	M	V	M		
3. Caking Index 3	1	1	V	M	N	N		
4. Ash Fusibility	1	1	M	M	1	V		
5. Grindability	N	N	N	N	V	N		
6. Friability	M	M	M	M	N	N		
7. Volatile Matter	M	M	M	M	1	M		
8. Fixed Carbon	N	N	N	N	M	N		
9. Ash Content	M	M	M	M	M	M		
10. Calorific Value	N	N	N	N	N	N		
11. Ash Viscosity	M	M	M	M	1	V		
12. Ash Composition		-	See Foo	tnote 4	_			

FOOTNOTES:

¹ Degree of fineness is a better term for P.F.

² Surface moisture is more critical than inherent moisture. Moisture is very important from the standpoint of plant flowability.

Some engineers are attempting to use the F.S.I. as an index of the degree of caking.

Ash composition is very important as it affects fireside fowling, but not important to combustion.

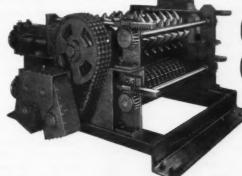
RATING CODE:

V - Very important

I — Important

M — Minor importance

N — Little or no importance



GUNDLACH CRUSHERS

provide greatest uniformity of SIZE CONSIST

Coal Utilization, in a survey, asked power plant operators to rate thirteen properties of coal as being very important, important, of minor importance, or of little importance. The plants participating were fired by single or multiple retort underfeeds, travelling or chain grates, spreaders, pulverized fines or cyclones.

Without exception the operators of every type of firing device rated size consist as very important or important. No other coal property even approached size consist in importance in their opinion.

Let a Gundlach Crusher prove to you through a crushing and screening test at your mine that it provides the greatest uniform-

test at your mine that it provides the greatest uniformity of size consist. Your customer benefits by control of top size...less fines...less unburnt coal in ashes ...more BTU output per ton...lower ash handling costs...greater overall utilization.



Division of J. M. J. Industries

Among the Manufacturers



New Plant for Collyer Insulated Wire Company

Collyer Insulated Wire Co., Pawtucket, R. I., has begun construction in Lincoln, R. I., on a 400,000 sq ft, singlestory plant (artist's sketch) which will consolidate operations now being carried on at four separate locations in Pawtucket and Central Falls, R. I. According to R. C. Moeller Jr., president of Collyer, the single-story design will permit the most effective possible lay-

out of the heavy equipment required in the manufacture of electric cables. One immediate advantage will be substantial reduction of materials handling costs. In announcing the decision to build, Mr. Moeller said that the new plant is part of the company's program for further improving its position in the industry through greater manufacturing efficiency and better facilities for customer service.

Richard M. Maxson has been promoted to national sales manager for P&H power

cranes and shovels by Harnischfeger Corp., Milwaukee, Wis. Mr. Maxson has been manager of the Buffalo district since November of 1957 and has been with Harnischfeger various sales de-



partment capacities since 1954. His new headquarters will be the Milwaukee home office. Albert B. O'Neal Jr., former sales representative from the Boston district office, has been named to work out of the Buffalo office.

Ken Smith has been appointed new field engineer for Flexible Steel Lacing



Co. Working out of Greensboro, N. C., his territory will cover the Carolinas, Virginia and East Tennessee. Mr. Smith's principle duties will be to do field missionary work for the benefit of distributors, hold

sales meetings and work with distributor salesmen.

Shannon C. Powers has been promoted to general manager of National Electric Div., H. K. Porter Co., Inc., Ambridge, Pa. Mr. Powers has been with the Peerless Electric Div. of Porter since 1951 and prior to his new appointment, was general manager of that

R. H. "Rudy" Hancock Jr. has been appointed district manager of the Salt





turer's representative, 9100 S. 150th E., Salt Lake County, Sandy, Utah. Mr. Hancock's district office will be at the same address as above. The Salt Lake City and Denver districts are two of 26 district offices maintained by Jeffrey in principal cities in the U.S.

Donald E. Shryock has been named field representative for Arcair Co., Lancaster, Ohio, in the mid-western United States. His duties will include working with the company's distributors and a broad range of industries in that area.

William S. McAleer has been elected vice president and a member of the



McAleer

board of directors of Peter F. Loftus Corp., Pittsburgh, Pa. Well known in the engineering profession, Mr. Mc-Aleer was formerly vice president of McNally Pittsburg Mfg. Corp., Pittsburg, Kan. Established in 1923 by

Peter F. Loftus, now president, the company provides electrical, mechanical, civil, structural, architectural and nuclear consulting, design and engineering services.

James L. Thornton has joined West Virginia Belt Sales, Inc., Mount Hope,



Thornton

W. Va., as chief engineer, Belting Sales. Upon graduation from West Virginia University, Mr. Thornton became associated with the Jones & Laughlin Steel Corp. and later the Allen Engineering Co. From

1930 to 1942 he held a position with the West Virginia Engineering Co. performing electrical engineering and consulting service for coal mines. He then became associated with Goodyear Aircraft Corp. and in 1945 was transferred to the coal section of Belting Sales, Industrial Products Div. of Goodyear Tire & Rubber Co. where he became manager and held that position until Dec. 1960. In this capacity his work consisted largely of design and consultation of underground mining throughout the U.S. He has been aptly labeled by the coal industry as the "Dean of Underground Conveyor Mining."

R. B. Park has been promoted from assistant sales manager to sales man-



Park

Industrial ager. Rubber and Mechanical Packings, Raybestos - Manhattan, Inc., Passaic, N. J. He was formerly district manager in San Francisco, having joined Raybestos-Manhattan in that city in 1954 after

an extensive background in the distribution of industrial supplies. Mr. Park replaces R. B. Hazard who has been appointed vice president-sales for these sales divisions of the company. Mr. Hazard was elected a director last October.

RSS QUICK CHANGE

Cutter Bit slashes bit changing time 85%

For fast, easy bit changing, try the new Carmer® RSS Quick Change Cutter Bit with keepers in JOY V-type chains. Simply pry set screw plunger outward to retracted position (cutter bit is released instantly)remove bit with free hand-replace bit-release plunger. Changing time is reduced 85%! Bit changes are just as fast in Bit Rings and Borer Blocks.

RSS Cutter Bits are designed for positive locking with JOY keepers. The threaded keeper plunger engages a forged notch in the tool shank, keeps the cutting tools locked firmly in place. No wobble, no battering of tool shank on keeper, no tools jerked out and lost.

And the RSS Cutter Bit is built to take abuse . . . with a beefed-up, load-bearing shoulder area that withstands higher cutting pressures . . . a plug-type carbide insert set at an angle that eliminates braze failure and insert loss ... a full radius tip design that fully supports the insert, reduces breakage, permits harder grades of carbide.

The carbide, of course, is Carmet carbide . . . famous for quality. In fact, Carmet Division manufactures the complete mining tool, and their reputation depends on Carmet Tools being the finest available. There's a Carmet Bit designed for universal machines and continuous miners of every make, and your Carmet distributor carries a complete line in stock for prompt delivery. Call on him for help with your mining tool problem. Allegheny Ludlum Steel Corporation, Carmet Division, Ferndale, Detroit 20, Michigan.

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For your copy, contact one of these Carmet distributors or write Carmet direct.

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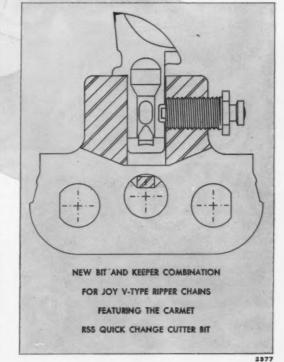
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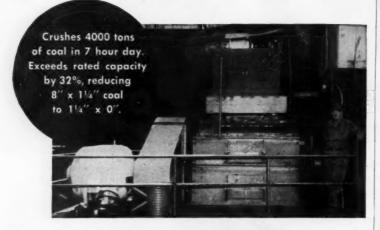
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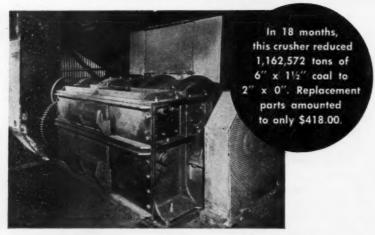


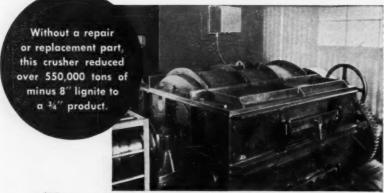
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When you figure costs, the best results come from American Rolling Ring Crushers



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ST. LOUIS 10, MISSOURI

Peter A. Laidlaw has been appointed general sales manager of Diamond Mfg.



Co., Wyoming, Pa., and is now spearheading expansion of this 50yr-old business in the production of perforated metals for a variety of industrial and architectural requirements. From his previous associa-

tion with Kaiser Aluminum & Chemical Sales Corp., Mr. Laidlaw brings a knowledge of modern product development and marketing methods which tie in effectively with planned advances in Diamond's manufacturing facilities.

Robert A. Cumming was appointed to the position of director, engine sales,



Cumming

Construction and Industrial Equip-Cummins ment. Engine Co., Inc. Columbus, Ind. Mr. Cumming has been associated with Cummins since early 1960 as manager, Los Angeles Regional Prior to Office.

that he was manager of manufacturer sales for Caterpillar Tractor Co.

C. L. Frost has been named manager of distributor sales of Hewitt-Robins. Inc., Darien, Conn. He was formerly a regional sales manager and previous to that, the company's advertising manager.

Company Briefs

All assets of Crescent Belt Fastener Co., Inc. have been purchased by the Crescent Fastener Co., Inc. Though policies of the old corporation will be continued, an expansion of the product line and a more aggressive sales approach through manufacturers agents is planned. President and treasurer of the Crescent Fastener Co. Inc. is A. J. McEwan and Margaret Merighi, secretary.

The Electric Storage Battery Co., Philadelphia Pa., has created a new sales and service organization-the Exide Industrial Marketing Div.-to serve as the marketing arm for its Exide Industrial Div. and its new Nickel-Alkaline Div. The Nickel Alkaline Div. was purchased from Thomas A. Edison Industries last August and was formerly the Edison Storage Battery Div. C. J. Moore, Exide's vice president-marketing, will head the new organization.

New M-S-A° AIRSLIDE Rock Dust Distributor increases hopper capacity 25 times

Up to now, hopper capacity for face rock dusting machines has been limited. It has been held to 160 pounds of rock dust by seam height and the need for steeply angled hoppers to keep rock dust flowing.

Now, with the Model SC AIRSLIDE you get hopper capacities from 1000 to 4000 pounds of rock dust . . . an increase of 25 times,

AIRSLIDE METHOD MAKES IT POSSIBLE

The AIRSLIDE method fluidizes rock dust so that it flows almost like water. A heavy belting, with uniform porosity, located in the bottom of the hopper, introduces low pressure air into the rock dust. This fluidizes the dust and makes the flow uniform and constant, even if the dust is damp. The steeply angled hopper is unnecessary. In fact, the rock dust will even flow down a 6° slope.

DISCHARGE RATE UPPED 6 TIMES

In addition to greater capacity, the discharge rate of the AIRSLIDE has been increased six times, to 600 pounds per minute. Large capacity and high discharge rate permit the volume dusting needed to keep pace with rapid advance work. AIRSLIDE uniformly covers ribs, roof and bottom in one operation, using one man. Cuts your dusting costs . . . noticeably.

For additional information call your MSA Representative. Or write, Mine Safety Appliances Company, Pittsburgh 8, Pa. In Canada: Mine Safety Appliances Company of Canada, Ltd., Toronto 4, Ontario.

*T.M. of Fuller Company

SAFET TOURFRIEN HEADQUARTERS



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THE IRONTON ENGINE COMPANY

STORAGE BATTERY — TROLLEY FARMINGDALE, NEW JERSEY (Formerly Ironton. Ohio. (902-1950)

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4 Model K Sand Pump
4 Edison 45 Lamp racks Complete
1 100 H.P. Model 420 Schramm Co
2 Loco. Type 125 H.P. Steam Boilers
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ALEX MUSHKIN

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2 TELEPHONES \$24-95 Infer-communication handsets, two wire system. Included Two 3 volt batteries. 30 ft. of wire and simple wiring instructions. Additional wire I cent per ft. or \$25,00 per mile. Complete list of telephone parts, handsets, magnete—common battery—ct. All shipments FOB Simpson, Penna. Write for free list.

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100—70 ton cap. Covered Hopper Cars 400—50 ton cap. Coal & Ore Hopper Cars 150—50 ton cap. Steel Box Cars 28 Diesel Elec. Locomotives, 25, 45, 65, 70 & 115 ton G.E. & Alcoa

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Check our listing of modern mechanical equipment—whether to completely mechanize or further mechanize your operation—we offer the most complete stock of used and rebuilt machinery.

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- 1—12G-3 Goodman Cutting Machine, A.C. 2—11BU-10APH Joy Loading Machines, 220/440 Volts A.C.

 4JCM Joy Continuous Miners, 440 Volts A.C.

 7B Sullivar Cutting Machines, 220/440 Volts A.C.

 3SL Jeffrey Cutting Machine, 220 Volts A.C.

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- LOADING MACHINES FOR SALE

 1—14 BU-TRAE Joy Loading Machine. 250 Volts D.C.

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 1—18 HR Joy Loading Machines, 250 Volts D.C.

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- Loading Machines.

 -14BU-7RBE Joy Loading Machines, 250 Volts, DC, excellent condition.

SHUTTLE CARS FOR SALE

- MUTILE CARS FOR SALE

 4—10SC Joy Shuttle Cars, 500 Volts DC.

 2—32E-16 Joy Shuttle Cars, 250 Volts DC.

 1—570-48 Goodman Shuttle Car, 250 Volts, D.C.

 1—55C Joy Shuttle Car, Elevating Discharge, Discharge, Discharge, Discharge, Discharge, State Cars, Elevating Discharge, 4-Wheel Steering, 250 Volts D.C.

 3—42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C.

 2-Standard, 1-Opposite Standard Drive.

 1—32E16 Joy Shuttle Car, Disc Brakes & Elevating Discharge
- Discharge

 -42E15A Joy Shuttle Car.
 -60-E Joy Shuttle Cars, 250 Volts D.C.
 -105C-28PXE Joy Shuttle Car, Permissible, equipped with 40J, 15 HP Motors.

CUTTING MACHINES FOR SALE

- -512 EJH Goodman Cutting Machines, 250 Volt DC.
 -29LC Jeffrey Cutting Machines, 250 Volts D.C.
 -10RU Joy Cutting Machines, 250 Volt D.C. with bugduster.
 -29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
 -512 CCH Goodman Cutting Machine, 250 Volts D.C.

- D.C.

 -35B Jeffrey Cutting Machines, 250 Volts D.C.

 -35BB Jeffrey Cutting Machines, 250 Volts D.C.

 -7AU Sullivan Cutting Machines, 250 Volts D.C.

 -35L Jeffrey Machine.

 -11RU Joy Cutting Machine, 250 Volt D.C.
- 1-11RU Joy

CONTINUOUS MINERS FOR SALE

2—1CM Joy Continuous Miners, 250 Volts D.C.
3—4LCM Continuous Miners, 440 Volts A.C.
1—5 JCM Joy Continuous Miner with self-tramming and extensive belt, 440 Volt AC, complete with 1000 feet of structure and belting with bridge conveyor between miner and belt.

RECTIFIERS FOR SALE

-400 KW American Selenium Rectifier, 4160 Volts Primary, 275 Volts D.C.

ROTARY CONVERTERS FOR SALE

- 1—300 KW Westinghouse, Pedestal Type Converter, 275 Volts D.C., Primary 2300/4000.
 1—150 KW Rotary Converter, Serial No. 1054562, with 150 KVA transformer and panel boards.
 1—100 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

- 1—150 KW Westinghouse Rotary Converter, Pedestal Type, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C.
 1—200 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

COAL DRILLS FOR SALE

- 1—Chicago Pneumatic R8D-30 Roof Drill.
 25—CP-472 Electric Coal Drills, 250 Volts D.C.
 5—CP-572 Coal Drills,
 10—Chicago Pneumatic Little Giant 572 Coal Drills,
 3 ubase. 220 Volt A.C., permissible, New.
 1—CD-25 Coal Drill, 250 Volts D.C.

CRUSHERS FOR SALE

- 1-Gruendler Ring Hammer 24" x 30" Crusher, Serial
- --Gruendler Ring Hammer 24" x 30" Crusher, Serial No. 1747. Double Roll Crusher, complete with 100 H.P. Motor.

 --Robins 36" x 36" Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.

 --Pennsylvania Single Roll Crusher, 24 x 40.

COMPRESSORS FOR SALE

2—Acme Self-propelled Air Compressors, 83R, Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.

LOCOMOTIVES FOR SALE

- 1—MH-150 Jeffrey Locomotive, 42" track gauge, 250 Volts D.C., 26/2" high, rebuilt.

 1—General Electric 6 Ton Locomotive with Reel,
- 36" gauge. -1030 Goodman Locomotive, 24" high, 44" track

ROCK DUSTERS FOR SALE

- 1—MSA Track Mounted Rock Duster, 10 H.P., A.C., or D.C., high pressure, 30" high, any gauge.
 2—MSA Bantam Rock Dusters, Rubber Tired, Port-
- able.

 2-MSA Bantam Rock Dusters, Skid Mounted.

 1-American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22" high.

HOISTS FOR SALE

- —Brownie Hoists, 5 H.P., A.C.

 #11/2 Vulcan-Demer Material Hoists, Complete
 with 3 H.P. D.C. Compound Wound 1750 RPM
 General Electric Motor.

 Brownie Hoist, Model HKM.—Good condition.

 Sullivan Type CHL, 5 H.P., Car Spotting Hoist.

 Joy CHD Hoists, 10 H.P.

ELEVATORS FOR SALE

2-Joy PL11-16 Elevating Conveyors.

1—T2-SAPE Joy Machine Truck, 250 Volts, D.C., equipped with hydraulic system for drill. 4—T2-SAPE Joy Trucks, 250 Volts D.C. Permissible.

CHAIN CONVEYORS FOR SALE

5—61AM Jeffrey Chain Conveyors, 10 H.P. 300' long, 3—61HG Jeffrey Chain Conveyors, 5 H.P. 40' long, 1—Jeffrey 300 ft, 15" Chain Conveyor.

DIESEL PLANTS FOR SALE

- 1—100 KW Waukeha Diesel Generator with 220/
 440 Volts D.C.
 1—100 KW Diesel Generator Unit, with G.M. Diesel
 Engine and 100 KW Generator.
 1—D13000 Caterpillar Diesel Generator Unit—with
 Caterpillar engine and 75 KVA G.E. generator
 self-regulating, 220 Volt A.C.

MOTOR GENERATORS FOR SALE

- 1-150 KW General Electric Motor Generator Set, 2300 Primary, 275 Volts D.C.
- 1-150 KW General Electric Motor Generator Set, 440 Volts A.C. Primary, 275 Volts D.C.
- 1-50 KW Westinghouse MG Set, 440 Volt A.C., 250 Volt D.C.
- 1—300 KW Westinghouse Motor Generator Set, syn-chronous motor, 433 KW Output, 435 KVA, 2200 Volts, 1200 RPM. D.C. generator 300 KW, 275 Volts, 1200 RPM. Compound Wound. Com-plete with D.C. panel and switch gear.
- -50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.
- -200 KW Ridgeway Motor Generator Set, Complete with switchgear and 1600 amo. I-T-E automatic circuit breaker, 2300 A.C., 275 Volts D.C.

BELT CONVEYORS FOR SALE

- 1-36" Joy Self-Tramming Extensible Belt, 1200 ft. long with belt and drive.
- 1-30" Joy Self-Tramming Extensible Belt, 1000 ft. long with belt and drive.
- 1-300 ft. Jeffrey Conveyor Line, complete
- 1-350 ft. LaDel Conveyor Line, complete.
- 300 ft. Joy 15" Pans and Chains.

ROOF BOLTING MACHINES FOR SALE

5—Fletcher Roof Bolting Machines; with permissible dust collectors.

THE FOLLOWING OFFERED AS A PACKAGE UNIT ONLY

- 1-5CM Joy Continuous Miner, 440 Volts A.C.
- 2-16SC Joy Shuttle Cars, matched pair, 440 Volts A.C.

MISCELLANEOUS FOR SALE

- 1—Compton Model 56 Auger with 300 H.P. Cummins Diesel Engine Drive, 210 feet 38" diameter auger (6 sections—35 feet each); 1—42" cutter head, 70 feet, 48" diameter auger (2 sections—35 feet each); 1—52" cutter head.
- 2-75 KVA Underground Transformers, Skid mounted 40" high.
- 3-30 KVA Underground Transformers, skid mounted, 40" high.
- 2—3 H.P. Gear Motors with 15" hand and tail assemblies.
- -5 H.P. Gear Motors with 15" head and tail assemblies.
- -75 KVA Transformers, 2300/4000 Wye to 220 Volts. 3-35B Jeffrey Armatures, 250 Volts D.C.
- 4-902, 250 Volts D.C. Westinghouse Motor Units,
- 1-PL 11-14 Joy Elevator.
- 10-Goodman 512 Cutter Bars and Chains.
- 173—AC&F 42" Gauge. 48" high Drop Bottom Mine Cars. Condition like new. 1-24" Fan with drive.
- 2—7½ H.P. Tricycle Type Rubber Tired Mine Tractors, 7½ H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors. 3—24 J Motors, 7½ H.P. 250 Volt D.C. 2—42" Track Gauge Phillips Carriers.
- 1-Manson Mine Jeep 40" Track Gauge equipped with 9J Motor.
- Large quantities of 40# and 60# ASCE Steel.

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CONTINUOUS MINERS

1—3 JCM Joy Continuous Miner, 250 V., D.C., Excellent Condition

CUTTING MACHINES

- -12RB Joy Cutting Machines, 250 V. D.C., Permissible, Dual Wheels, Bugdusters, 9' Bar, Excellent Condition -11RU Joy Cutting Machines, 250 V. D.C., Permissible, Bugdusters, one completely rebuilt -70 URB Jeffrey Cutting Machine, 250 V., D.C., Excellent Condition -29U Jeffrey Cutting Machine, 220/440 V. A.C., Completely rebuilt

- Completely rebuilt Machine, 220/440 V. A.C., Completely rebuilt —512 Goodman Cutting Machines, 250 V., D.C., Hydraulically or Manually Controlled —824 Goodman Slabber, 250 V. D.C. —358 and 358B Jeffrey Cutting Machines, A.C. and D.C.
- and D.C.
 6—7AU Sullivan Cutting Machines, 250 V. D.C.
 7B Sullivan Cutting Machines, 250 V. D.C.
 16—11B Sullivan Cutting Machines, 35 & 50 h.p., 250 V. D.C.
 18—12AB, 12AA and 112AA Goodman Cutting Machines, 250 V. D.C.
 9—212AA Baby Goodman Cutting Machines, 250 V. D.C.

BELT CONVEYORS

- 1-36" Joy Model "C" Belt Conveyor, 1,080"
- 1—36" Joy Model Control Control Control
 centers
 7—MTB 30 Joy Tandem Belt Conveyors, 1,000'
 centers, 25, 40 & 50 h.p., one with Scandura Flame Proof Belting
 0—48" Link Belt Conveyor Structure
 1—30" STHC Goodman Tandem Belt Conveyor
- 1—30" 97MC Goodman Tandem Beit Conveyor Drive 4,280'—30" 99-5GT Goodman Beit Conveyor Structure 5—99-5GT Tandem Beit Conveyor Drives 1—30" Shop Constructed Beit Conveyor Drive 288'—30" Barber Greene Beit Conveyor Structure 8,760'—26" Joy Model "C" Structure 18—26" Beit Conveyor Drives, various makes

LOADING MACHINES

- 3—118U Joy Loaders, 250 V. D.C.
 4—88U Joy Loaders, A.C. & D.C., rebuilt
 2—148U-7RE Joy Loaders, 250 V. D.C.
 1—148U-7RE Joy Loaders, 250 V. D.C.
 6—148U-3PE Joy Loaders, 250 V. D.C., 28" O. H.
 4—148U-2E Joy Loaders, 250 V. D.C., 28" O. H.
 3—128U-9E Joy Loaders, 250 V. D.C., rebuilt
 4—208U Joy Loaders, 250 V. D.C., Permissible
 1—360 Goodman Loader, 07 rubber, 250 V. D.C.
 1—24BB Clarkson Loader, 250 V. D.C.
- SHUTTLE CARS

- 8-60E-10 Joy Shuttle Cars, w/Elevators, matched pairs, 250 V. D.C.
 10-42E Joy Shuttle Cars, 250 V. D.C.
 19-65C Joy Shuttle Cars, metched pairs, 250 V. D.C.
 2-85C Joy Shuttle Cars, Elevators, 250 V. D.C.
 19-35C Joy Shuttle Cars, Elevating Discharge, Permissible Plates, Excellent Condition, 250 V. D.C.
 17-32E-10 & 32E-16 Joy Shuttle Cars, Excellent Condition, 250 V. D.C.
 1-32D Joy Shuttle Car, complete w/batteries
 2-M766-A45 Jeffrey Shuttle Cars, 250 V. D.C., matched pair, Excellent Condition
 3-6 Ton Locomot 3-7 Ton Locomo

MISCELLANEOUS TRACKLESS EQUIPMENT

- 1—WK-83R Joy Compressor, 240 cu. ft. 1—WL-82 Joy Compressor, 125 cu. ft. 5—T2-5AE & T2-2E Joy Machine Trucks 2—T14G Joy Machine Trucks, 220 V. A.C. 1—Lot 9J, 10J, 23J and 24J Motors

PREPARATION EQUIPMENT

- 1—4 Cell Jeffrey Baum Jig Washer, complete, 300 t.p.h. capacity 1—Simon Carver Heavy Duty 2 compartment Baum Jig, 400 t.p.h. capacity

- -Daniels Heavy Media Washer -48" CMI Centrifugal Dryer -Heat Dryer, complete -36" x 130" Hot Material Handling Belt, Excellent

- cellent
 4-7' x 15' Single Deck Diester Tables
 1-36" x 38" Jeffrey Single Roll Crusher
 1-36" x 33" Marion Double Roll Crusher
 1-300 x 36" Seffrey Double Roll Crusher, Like New
 1-300 x 36" Seffrey Double Roll Crusher, Like New
 1-300 x 36" Par. Single Roll Crusher
 1-24" x 50" Pa. Single Roll Crusher
 1-24" x 24" Jeffrey Single Roll Crushers
 1-24" x 24" McClanahan & Stone Single Roll
 1-18" x 12" Jeffrey Swing Hammer Pulverizer
 1-18" x 12" Jeffrey Swing Hammer Pulverizer
- 1—18" x 12" Jeffrey Swing Hammer Pulverizer 1—6' x 16' Allis Chalmers Double Deck Low Head

- 1-6' x 16' All'is Chalmers Double Deck Low Head
 Vibrator
 1-6' x 14' Single Deck Allis Chalmers Low Head
 Vibrator, Like New
 1-5' x 16' Triple Deck Allis Chalmers Ripl-Flo
 Vibrator, Like New
 1-5' x 16' Single Deck Allis Chalmers Low Head
 Vibrator, Like New
 2-5' x 12' Allis Chalmers Single Deck Low Head
 Vibrators
 1-5' x 12' Allis Chalmers Ripl-Flo Double Deck
 Vibrator
 1-5' x 10' Double Deck Robbins-Gyro Vibrator,
 Like New
 1-4' x 12' Hewitt Robbins Vibrex Screen, Triple
 Deck
 1-4' x 7' Jeffrey Traylor Double Deck Vibrators

CHAIN AND SHAKER CONVEYORS

- 20" Joy Chain Conveyors, A.C. & D.C., Permissible 15" Chain Conveyor Drives, A.C. & D.C., Permissible 15" Long Chain Conveyors, A.C. & D.C. 12" & 15" Leffrey Chain Conveyors 12" Goodman Chain Conveyors PT12 Long Piggyback Conveyors PT12 Long Piggyback Conveyors Goodman G12½, G15, & G20 Shaker Conveyor Drives Joy Ladel UNI7 Shaker Conveyor Drives Goodman Power Duckbill & Duckbill Hoists

- LOCOMOTIVES

 4—20 Ton Jeffrey MH77 Locomotives, 42" & 48" t.g.
 1—15 Ton HM828 G.E. Locomotive, 90 h.p. units,
 44" O.H., 48" t.g., Excellent
 1—14 Ton MH110 Jeffrey, 42" t.g.
 6—13 Ton Locomotives, 250 V., any gauge
 1—12 Ton 29B Goodman Locomotive, 40" O.H.
 11—10 Ton Locomotives, 250 V., any gauge
 8—8 Ton Atlas Battery Locomotives
 9—6 Ton Locomotives, any gauge
 3—6 Ton Jeffrey MH150 Locomotives
 15—6 Ton MH88 Jeffrey Locomotives
 9—5 Ton Locomotives, 250 V.
 17—4 Ton Locomotives, 250 V.
 18—4 Ton G.E. Battery Locomotive, 48" t.g.
 2—4 Ton Mancha Battery Locomotive, 48" t.g.

SUB STATIONS & TRANSFORMERS

- 3-150KW G.E. Rotary Converters, w/Transfor-

- 3—150KW G.E. Rotary Converters, w/Transformers
 1—150KW Westinghouse Rotary Converter, completely Automatic
 9—150KW M.G. Sets of various makes & voltages
 2—100KW M.G. Sets
 1—100KW Westinghouse Generator, 250 V. D.C., connected to Buda Diesel Engine, complete w/boards
 2—100KW Generator, w/671 G.M. Diesel
 1—90KW Generator, w/671 G.M. Diesel, Excellent
 1—75KW Generator, w/1019 Diesel Engine
 1—75KW Generator, w/1019 Diesel Engine
 1—75KW Generator, w/1019 Diesel Engine
 1—100KVA Gasoline Alternator Unit
 1—50KW M.G. Set, 125 V. D.C., 1200 rpm
 2—Armatures for 200KW Rotary G.E., type HCC
 2—600 & 800 Auto Transformers
 186—Transformers from 1½KVA to 800KVA, list sent on request.

- MINE CARS
- 90—36" t.g. Drop Bottom Cars
 155—42" t.g. End Dump Cars, various makes
 176—42" t.g. S. D. Drop Bottom Mine Cars
 45—42" t.g. A.C.F. Drop Bottom Cars
 22—44" t.g. Drop Bottom Cars, 10 ton Capacity
 130—44" t.g. Drop Bottom Cars, various sizes
 333—44" t.g. End Dump Cars, various sizes
 327—48" t.g. S. D. Drop Bottom Cars
 259—48" t.g. A.C.F. Drop Bottom Cars
 2—56½" t.g., 3 Ton, 4 Wheel Push Trucks, (NEW)

RAIL AND WIRE

- RAIL AND WIRE

 1,285—Tons 30, 45, 56, 65, 70, 90 & 100 lb
 Relaying Rail
 325"—2,000,000 CM Bare Copper Feeder Cable
 3,689"—1,000,000 CM Bare Copper Feeder Cable
 7,357"—500,000 CM Bare Copper Feeder Cable
 2,000"—2,00 Stranded Copper Highline Wire
 15,000"—1,10 Solid Copper Highline Wire
 15,000"—2 Stranded Copper Highline Wire
 12,100"—2 Stranded Copper Highline Wire
 2,380"—45 Solid Copper Highline Wire
 3,900"—46 Solid Copper Highline Wire
 3,900"—46 Solid Copper Highline Wire
 3,900"—46 Solid Copper Highline Wire
 3,900"—47 Solid Copper Highline Wire
 4,797"—4/0 Fig. 8 Troiley Wire
 8,000"—4/0, 3 Cond. vibber covered cable, 5,000
 4,793"—3 Cond. Anhydres & Lead covered
 10,000"—2,0, 3 Cond. Lead Covered Cable, 5,000 V.
 6,200"—11,3 Cond. Lead Covered Cable, 5,000 V.
 2,500"—11,4" Steel Cable, New
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 Several Thousand feet #2, #3 and #4 approved type machine cable

MISCELLANEOUS

- ISCELLANEOUS

 1—Canton Track Cleaner, Excellent
 17—HKL, HKG, HKD, HKC, HL & CH Brown
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 48—Air Compressors of various sizes
 57—Auto Starters from 3 h.p. to 100 h.p.
 270"—pipe Galvanized, Plastic & Cast Iron
 81—Hoists from 1½ to 800 h.p.
 13—Shop Constructed Jeeps, track mounted
 7—Hyd. Schroeder Coal Drills
 112—Pumps from ¾« to 4500 GPM
 81—Coal Drills, various makes and sizes
 1—300 GOM 6" Pomona Deep Well Pump
 1—14" Centrifugal Slurry Pump
 45—Room Blowers Brown Fayro & Jeffrey
 26—Mine Fans from 30" to 9" HI Pressure
 17—Battery Chargers, various voltages
 11—Rock Dusters up to 30 h.p.
 4—Phillips Machine & Shuttle Car Carriers,
 36" to 48" there is shuttle Car Carriers,
 142 Ton Richards Truck Scale, 10" x 25"
 200—Stationary Motors—1/s to 800 h.p. 4 6 8

1—Westinghouse A.C. Sub Station, 4500 KVA, 6900/2300, complete w/boards, Excellent
4—300KW M.G. Sets
5—200KW M.G. Sets
4—200KW, HCC-6-1200 G.E. Rotary Converters, Automatic

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11-Joy 10SC Shuttle Cars, right and left hand drive.

CUTTING MACHINES, 250 VOLTS DC

5—10RU Jey Cutting Machines. 2—324 AA Goodman Slabbers—Track Gauge 42".

TROLLEY LOCOMOTIVES, 42" TRACK GAUGE FOR 250 VOLT DC

- 1-13 ton Goodman-Type 81A04T, completely
- modern. -Goodman 13 ton 1368-0-4-6 with 2-75 H.P.

- 1—Geodman 13 ton 1368-0-4-6 with 2—75 M.P. Motors.
 2—13 ton Jeffrey Locemotives (1—inside frame and 1—outside frame).
 1—Geodman 5 ton 3013 with 1—50 H.P. Motor 4—8 ton 132AK42-48R Geodman with 2—50 H.P. Motors with reels.
 1—8 ton 32-0-4-T Geodman with 2—50 H.P. Motors with reels.
 1—8 ton LM2-8-T.DD General Electric with 2—50 H.P. Motors with reels.
 3—6 ton LM2-8-T.BD General Electric with 2—35 H.P. Motors with reels.
 2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reels.

BATTERY LOCOMOTIVES, 42" TRACK GAUGE

16—Greensburg Monitors complete charging equipment and batteries.

4—Mancha Locomotives complete with charging equipment and batteries.

LOADING MACHINES, 250 VOLTS DC

6—11BU Joy Loading Machines, completely mod-ern with separate pump motors. 3—360 Goodman Loading Machines.

- MOTOR GENERATOR SETS

 4—General Electric 300 KW Motor Generator Sets, 1200 RPM, primary voltage 2300/4160, 275 Volts DC, complete with panel boards.

 3—General Electric 200 KW Motor Generator Sets, primary voltage 2300/4160, 1200 RPM, 275 Volts DC, complete with panel boards.

 1—Westinghouse 200 KW Motor Generator Set, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

 2—Westinghouse 150 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

3—Joy PL 11 Elevating Conveyors. 3—Joy PL 11 Side Dumps.

RELT CONVEYORS

- 1—Hewitt-Robins Slope Conveyor, 980 ft. long, 42" wide, equipped with 200 H.P. 440 Volt AC Motor for man trip), complete with 42" x 5 ply Rubber Conveyor Belt, Ajax Raynlle #130 1/4" top cover and 1/16" bottom cover with Nylon
- 4,000 feet of Rubber Belt 35" wide. 1—40 H.P. Goodman 35" Belt Drive with Tail, 250
- -40 H.P. Goodman 50 Volts DC. Rebins Belt Conveyor 35" wide, 150 ft. long complete with Allis-Chalmers, 30 H.P., 220/440 Volt AC Drive.

MINE CARS

- 100—ACAF, Three-Door Drop Bottom Mine Cars, 48" High, 17 ft. 7 1/4 in. overall length, capacity 271 cubic feet level full, 42" gauge. 100—Sanford-Day Three-Door Drop Bettom Mine Cars, 35" high with an 8" sideboard, 16 ft. 10 1/2" overall length, 42" gauge.

WIRE MATERIAL

TRACK MATERIAL

75—40# Switches. 1,000—40# Ties. 1,000 Tons—60# Rail. 51—60# Switches. 1,000—60# Ties.

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY PARTIAL LIST OF MAJOR ITEMS OF TIPPLE:

- PARTIAL LIST OF MAJOR ITEMS OF TIPPLE:
 Sizes of coal: from 1/4 x 0 to 7 x 4" Block.
 CMI 48" Dryer—complete with motors, drives, belt, etc., screen cloth 1/16" opening capacity 90 ton per hour.

 1—Coppus Ventair Blower #24708.
 Pulverizers: (American Pulverizers) 4—# 305, Ser. #3218—AC3, Serial #1798, AC3B, Ser. #3127, WC-24, Ser. #3240.

 Ser. #3240—Ballis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.

 1—16 x 14 Allis-Chalmers Centrifugal Pump, complete with motors, starter, breakers.

 1—Roberts & Schaefer Air Drying Plant, complete (specifications furnished on request). Consists of Belt & Chain Conveyers complete with motors, drives, 36" Belt also some 24" and 30" Belt.

WELDERS

- 1—Lincoln, 300 amp. M.G. Set. 2—Hobart, 300 amp. M.G. Sets. 1—G.E., 400 amp. M.G. Set. 4—Guyan 200 amp. Resistance Welders.

AUTOMATIC DECLOSING ROFAKEDS

- 5—Armstrong 60 H.P., AC 440 Volt Compressors. 5—Armstrong Coal Breakers, Medel EB-301. 5—G.E. Motors 60 H.P., Type K, Frame 504, 220/ 440 Volt AC, 1180 RPM.
 - ent and controls complete

DODTAFFFOFD

1-Nolan Portafeeder.

- COAL DRILLS

 Manson Trucks—10 H.P., DC Tram Motors on 4, 7½ H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7½ H.P., DC.

 3.—Manson Track Trucks, each truck with 2 drill arms & 2.—580 drills.

 2.—Manson Track Trucks, without drills.

 9.—Dooley Rubber Tired Trucks, equipped with twa arms and two 580 drill motors.

- 1—Joy RBD-7 with 15 H.P. Reliance Permissible DC and mounted on Manson with 7½ H.P. Westinghouse on Rubber.

 1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.

 1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Metors.

POCK DUSTERS

1—American Mine Door Road Cleaner. 2—MSA Rock Dusters, 25 H.P. Track. 3—MSA Bantam Rock Dusters, 2 H.P.

2—(Shop Built) Mobile Repair Trucks. 4—Personnel Jeeps, 42" Track Gauge.

- orven.

 4 ft. Jeffrey Aerodyne Fan complete with 60 k.P., 220/440 Veit AC Meter and Auxiliary Ford Industrial Power Unit gasoline drive, complete with all necessary equipment and controls.

TRANSFORMERS

- ARATIVENEED

 -2400/4160 Y, 240-480 Voits, 100 KVA General Electric Single Phase Transformers.

 -2400/4160 Y, 240-480 Voits, 333 KVA General Electric Single Phase Transformers.

 -2300/4160 Y, 230-115 Voits, 200 KVA General Electric Single Phase Transformers.

 -2300/115/230 Voit, 15 KVA General Electric Single Phase Transformers.

Complete inventory of new parts for 10SC, 10RU and 11BU Jay Equipment plus cable, tools, hard-ware, etc. for operation of mine.

BATHHOUSE EQUIPMENT

355—Baskets with Chains, 20 shower heads and complete equipment for operation of bath-house.

LAMP HOUSE

2—1500 amp. I.T.E. Modern with reverse current relay.

1360—R4 Cap Lamps complete with necessary charging equipment.

23—Flame Safety Lamps.

MOBILE EQUIPMENT

- 1—Koehring Heavy Duty Crane—C5521.

 1—Shovel Dipper Stock for same—Size 301, Serial No. 61, Length 16 feet—34 yard dipper.

 1—International 1950 Flat Bed Truck Tandem with steel bed and wench, Ser. #3438, 3 axies, -International 1950 Flat Bed Truck Tandem with steel bed and wench, Sor. #3438, 3 axies, weight 18,500 lbs.
 -Hough Pay Leader, Model MF and HFH, Serial No. 81221.
 -Allis-Chalmers Tractor HD9-B27.
 -Allis-Chalmers Tractor HI LIFT—Model HD5, Model #24-27482, Serial No. 22246.
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- 3N4/78. Whiting Track Mobile, Serial #TM-209. Relier—W. M. Bros. Boller Mfg. Co., Model 678, Ser. #RR-2734, weight 2950 lbs.

COMPLETE SHOP AND OFFICE EQUIPMENT

STATIONARY MOTORS

AC and DC Meters ranging from 1 to 300 H.P.

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Hundreds of other items such as pumps, meters, armatures, locomotive trucks, wheel units, hydraulic pumps, conveyer chains, cat chains, tipple draglines, etc., too numerous to list.

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COAL AUGER COMPTON Model 48, Serial #6R-353-027-MG, 1953, 48", Includes Hercules Auxiliary Engine for Hydraulic System, Kohler Light Plant, (8) 48" and (5) 42" Flights. Powered with 300 HP Cummins Model NHR1S-600 Diesel (2100 RPM) Engine, Electric Starting System, Will Drill 212' into Coal

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9-W B.E. Diesel Drag, 165°, 12 yd.

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7-W B.E. Diesel Drag, 160°, 7 yd.

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7-W B.E. Diesel Drag, 175°, 13 yd.

7-W B.E. Diesel Drag, 175°, 13 yd.

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8-W B.E. Drag, 200°, 8 yd.

8-B. Pake Diesel Drag, 130°, 10 yd.

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2400 Lima Elec. Drag, 130°, 6 yd.

2400 Lima Elec. Drag, 130°, 6 yd.

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111-M Marion Standard & H.L. Shovels

120-B B.E. & Standard & H.L. Shovels

120-B B.E. & Standard & H.L. Shovels

131-M Marion Standard & H.L. Shovels

132 Down.-The-Hole

1134 Marion Standard & H.L. Shovels

134-B B.E. Standard & H.L. Shovels

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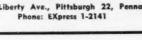
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Rear, Bottom Dumps and Scrapers "Other equipment available not listed above"

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Save 30% on Near NEW PORTADRILL 6TA BLAST HOLE DRILL used 500 hours only

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3—Joy 14BU 9ÅE Super Loader—26" HI—New
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3—Joy 148U Loaders, low pedestal, 7AE, 1956 & 57.
6—Joy 148U Job Loaders, medium pedestal, 7RBE.
4—Joy 148U 3PE Loaders.
1—Joy 128U Loaders complete with Piggybacks.
2—Joy 128U Loaders, 9E, latest type, 250 V. DC.
3—Joy 128U Loaders, 220/440 Volt AC.
1—Joy 208U Loader, 220/440 Volt AC.
1—Joy 3BU Loader, 220 V. AC.
1—Joy 8BU Loader, 34" overall height.
2—Joy 8BU Loader, 220 V. AC.
1—Joy curved Bar Head for 148U, complete.
6—Reliance 24-J Meters, 7/4 H.P.
4—Reliance 38-J Meters, 7/4 H.P.
4—Reliance 38-J Meters, 10 H.P.
2—Sebodman 650 Loaders on Crawlers 440 V. AC, like new. -Goodman 660 Loader on Crawlers, excellent 250 V. DC. Goodman 665 Loader on Crawlers, latest type an 865 Leader, 26" hi. Rebuilt. 250 V Goodman 855 Leader, 28" hl. Rebuilt. 230 V DC.

Joy 85C Shuttle Cars, rebuilt, latest type.

Joy 65C Shuttle Cars, rebuilt, latest type.

Joy 55C Shuttle Cars, rebuilt, latest type.

Joy 32E9 Shuttle Cars, rebuilt.

Joy 32E15 Shuttle Cars, rebuilt.

Joy 32E15 Shuttle Cars, rebuilt.

Joy 32E15 Shuttle Cars, rebuilt.

Joy 42E16 Shuttle Cars, rebuilt.

Joy 72E2 Drill, on rubber, like new.

Joy 7-2-5 lew pan Crawler Trucks, rebuilt.

Joy 7-2-5 lew pan Crawler Trucks, rebuilt.

Joy 7-1 Standard Crawler Truck, 250 BC.

Joy 7-8 Cutting Machine, like new, 25 V. DC.

Goodman 212 Cutting Machine, 19" high.

Goodman 412 Cutting Machine, 19" high.

Goodman 412 Cutting Machine, 19" high.

Goodman 412 Cutting Machine, 19" high.

Goodman 512 Machines with Bugdusters. -Goodman 512 Machines with Bugdusters. -Goodman 612 Cutting Machines, 250 and 500 250 V. D.C.

Joy 10RU Rubber Tired Cutter, Universal head, 220/440 V. A.C. Perfect.

Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C. Rebuilt or as is.

Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C. Rebuilt or as is.

Jeffrey 29LU Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on Crawlers, 250 voit D.C.

Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

Goodman 8 ton, 93-A, 27" high, armor plate frame. frame. Jeffrey 15 ton MH-77 Locomotive, armor plate frame.

-Jeffrey, 13 ton, type MH-110, 38", 42", 44" ga.

-Jeffrey, 10 ton, type MH-110, 42" and 44" ga.

-Jeffrey, 10 ton, type MH-8, 42" and 44" ga.

-Jeffrey, 10 ton, type MH-8, 42" and 44" ga.

-Jeffrey MH-150, 6 ton, 28" everall height, rebuilt, with reel.

-Jeffrey, 5 ton, type MH-88, 42", 44" and 48" ga.

-Jeffrey, 8 ton, type MH-100 2½" armor plate frames. frames.
—Jeffrey, 4 ton, type MH-96, 42", 44", 48" ga.
—G.E., 4 ton, type 825 Locomotive, 22" high.
—G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" ga.
—G.E., 8 ton, type 822 Locomotive, 44" ga.
—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.
—G.E. 13 ton, type 829 Locomotives, armor plate frames. Goodman 91A Locomotive, 8 ton, 28" overall height. height.

Goodman, type 33, 8 ten, 44" and 48" ga.

Westinghouse, type 902, 4 ten, 42" and 48" ga.

Atias Battery Locomotives, 38" ga.

Atias Trelley Locomotive, 4 ten, 24" high.

Westinghouse, type 904, 6 ten, 44" and 48" ga.

Westinghouse, type 906, 44" and 48" ga.

Westinghouse, type 907, 10 ten, 44" & 48" ga.

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3—Westinghouse 908, 13 ton, Locomotive, 42"48" ga.
3—Jeffrey MH-78 Locomotive Units, cheap.
5—Jeffrey MH-78 Locomotive Units, reasonable.
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4—197 20" Conveyors, 300'.

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2—Goodman 686 Leader, 440 V. A.C., perfect.
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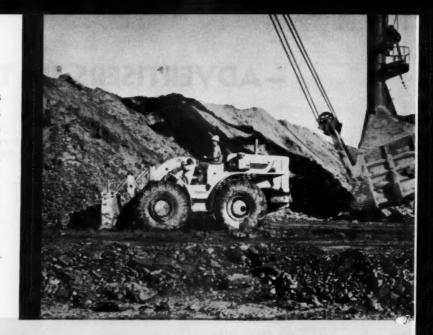
*Allegheny Ludlum Steel Corp 143	*Kennametal Inc. 47 Koehring Co. 59
Allis Chalmers	Koehring Co
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*Bird Machine Co 4	
*Bowdil Co	Manhattan Ruber Div. Raybestos-Manhattan Inc
Bucyrus-Erie Co 82-83	Manitowoc Engineering Wks 131
	*McLanahan & Stone Corp 135
*Carmet Div.	*McNally Pittsburg Manufacturing
Allegheny Ludlum Steel Corp 143	Co
Caterpillar Tractor Co 8, 24-25, 39, 154	*Metallurgical Products Div
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Connellsville Corp	
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Humble Oil & Refining Co	
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Ford Motor Co	*Post-Glover Electric Co
Ford Motor Co	
Galis Electric & Machine Co	Republic Steel Corp 53
*Goodman Manufacturing Co 40-41	*Roberts & Schaefer Co
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Hendrix Manufacturing Co	*Schroeder Bros. 108
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*Jeffrey Manufacturing Co 2-3, 119	*Texaco Inc
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*United States Steel Corp. (UCO) 121	
AV. 1 D. G	
*Vascoloy Ramet Corp	
Vulcan Iron Works Co	
Wedge-Wire Corp 56	
*Westinghouse Electric Corp 92-93	
Whitmore Manufacturing Co 62	
Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp	
*Wild Heerbrugg Instruments Inc 52	
*Wilfley & Sons Inc. A.R Third Cover	
BUSINESS OPPORTUNITIES 146	
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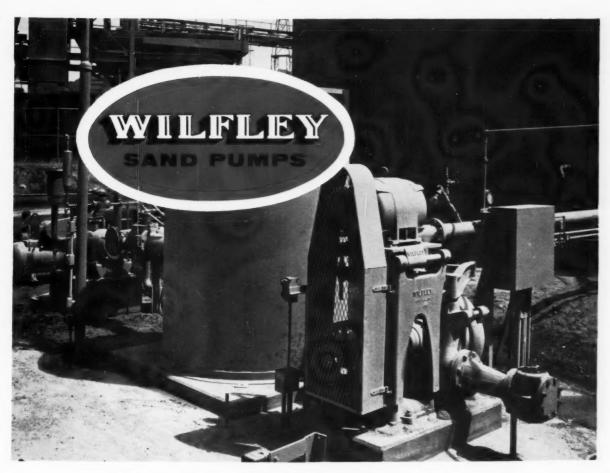
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